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SIR RABINDRANATH TAGORE'S VIEWS ON SOME EDUCATIONAL QUESTIONS.

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IN continuation of the views published in the February issue of this *Journal* are laid before the reader the following which have been taken from Sir Rabindranath Tagore's subsequent conversations.

I. *A most fundamental need.*—It is an imperative necessity that India of the present, and especially her universities should, adequately realise her ancient sense of *equality*, which the narrowness of castes and creeds has during recent times almost stifled. This misfortune has to be partly traced to the exclusive cultivation of Sanskrit by the few. It is high time that the illiberal walls were pulled down, and equal chances afforded to every one in the land to secure the benefit of the intellectual and spiritual legacy which India's children have jointly inherited. The great thoughts in her *ancient* Sanskrit literature, if rightly understood and rightly interpreted, would be the most powerful antidote for the modern narrowness and exclusiveness which have contributed not a little to her sufferings. Sanskrit education should therefore be denied to none. It will help best to put into the hands of every one of India's sons and daughters, a vernacular *efficient* for the acquisition of a higher culture common to all India.

Again, if it is agreed that universal or national education is not possible except through the vernaculars, it is absolutely necessary to make them fit instruments for this purpose. That they serve best as media for instructing children in the lower stages is readily acknowledged. Whether as the languages of the masses, mostly illiterate, they could express highly abstract, scientific, technical and literary ideas has been a matter of grave doubt. In fact, their inherent deficiency in this respect has been patent from time immemorial, inasmuch as they have had to borrow words from Sanskrit to convey deeper and technical thoughts. And if from these tongues the Sanskritic element should be eliminated, there would be left in the great majority of them little to indicate real culture. If the Vernaculars, therefore, are to respond to the need either of the higher and the university stages of study, or of modern public life in India, whatever gives these languages the capacity to form abstract, scientific and literary terms should be strengthened. In other words, without a reinforcement of the Sanskrit alement the vernaculars can never fulfil the higher functions of Education.

If they are not to depend on Sanskrit, they must beg of European languages for sustenance. Else they will die of inanition in the modern struggle for existence. Which then is the more practicable and the easier of accomplishment: either to cut off the Sanskritic source and to open in their stead new European channels; or to retain the Sanskritic element, to develop it and to

supplement it by borrowing not from the languages of Europe alone, but from those of all *the world, whatever may* be needed ?

It is sometimes argued that Sanskrit is a 'Dead' language, and that as such it can infuse no life into the vernaculars : or rather, its influence would be retrogressive, and would unfit the people for the modern struggle. But 'dead' is an epithet which only means 'not current' and that in a particular form. The words of a language bring with them not merely sounds but also ideas. Who does not know that Sanskritic ideas imported by the Sanskrit words in the Vernacular are at the present moment inflencing Indian life as deeply as the vernacular ones ? And what is more, like the Greek and the other classical literatures of Europe, the Sanskrit culture contains many thoughts of value to the end of time : thoughts to which men not only of India but of the entire world would recur again and again, thoughts that can never be old and therefore much less 'dead.' 'Dead' as applied to a language like Sanskrit signifies, therefore, neither 'uselessness,' nor 'lifelessness.' And if the vernaculars are still 'living,' it is because they still continue to draw upon the Sanskritic source of vitality.

The need for frequent translations from one Indian language to another, not only for their common enrichment but also for the development of mutual intellectual sympathy is increasingly felt. Is any argument, then, required to show that with the common Sanskrit element developed, it would be easier to achieve this object than with the common features of the vernaculars suppressed or whittled down to the least possible dimensions.

Again, one of the serious problems demanding solution. in this country is that of a *common* popular tongue, *at least* for all non-Urdu population. And this hope will be nearer realization only if a knowledge of the *common* Sanskrit element be spread rapidly and wide : and not by any other means yet known.

One of the first steps to be taken therefore in the matter of Indian Educational reform is to make the *Elements* of Sanskrit a *Compulsory* subject of study for every non-Urdu pupil, wherever the advancement of the Indian vernacular is sought.

A frivolus objection.—That a simultaneous study of two or three such languages entails undesirable strain, upon the child is, to say the least, a thoughtless criticism. This argument would have some force if Sanskrit were a foreign tongue or if it were made a medium of instruction. At the present moment, in many parts of India, Sanskrit and the vernacular are actually being taught. In the past, the Lingayats of the south and the Jains, not to say anything of the Brahmins, all over India, studied Sanskrit and a vernacular. Most Urdu speaking Mahomedans learn, even now, not only Urdu and sometimes the local vernacular, but also Persian or Arabic. And in Europe, America and Japan children learn, in most schools, more than two languages oue of which is often a foreign tongue. And yet the complaint of a 'strain' has not till now been heard. There may be a few subnormal minds that find it difficult to study more languages than one. And even for normal minds, the acquisition of languages, late in life, is really a difficult task. But to the average child the learning of languages, especially allied ones such as Sanskrit and those Indian vernaculars that have borrowed largely from it, can never be a strain. It is at bottom only a question of the method of teaching languages, at that stage. The book-method now so frequently employed is the very opposite of rational. At Bolpur not only Sanskrit but even English is taught without books. No *practical educationist* can contend that the study of Sanskrit at an early stage will tax the mind of average Indian children speaking the Indian vernaculars.

If the study of Sanskrit is dropped in our schools we cut ourselves off from our past completely and gradually westernize ourselves. And this would amount to our suicide.

The real advantage of the vernacular medium.—It is true that those who graduate in the vernacular have comparatively more limited prospects in modern life than their brethern, who acquire knowledge through English. But the fact should not be ignored that those who take the vernacular path can gain more knowledge in the same time. In Germany, for instance, the average boy of the High School stage knows more than his compeer in India. *The standard should, therefore, be raised when the vernacular medium is adopted.* And it will follow naturally that a vernacular graduate will command a higher market value than the English, whose general standard of attainments would be lower, in spite of his special knowledge of English. The vernacular men ought, in the interests of every government, to be preferred for public service. Men and women will then naturally seek in larger numbers, the vernacular courses, which will rapidly increase its popularity.

II. *Should men and women have different media of Instruction?* The answer is no. When the standard of the vernacular courses is raised and when their market value rises, this question will find a natural and an easy solution. Every woman must be at liberty to choose the course that suits her capacity.

III. *The Co-operative Idea.*—Too much emphasis cannot be laid on the great possibilities that the application of the principle of Co-operation' has in the educational world. For more reasons than one, India urgently needs its adoption. It is not merely the financial and the social aspects, but other considerations of a more directly educational nature that call for its introduction. Whether school-work should not have a bearing upon the present, as well as upon the future environment of the child is not questioned. It is also admitted that the child must be made to draw inspiration from the social life outside the school-world. But it is more important that the life outside the school should contribute to life within, which can be done best by the children *co-operating* with the men in practical life. Let the pupil assist in cultivating the school lands, in building the school houses, in managing the school Banks and moneys, school shops, and boarding houses, in policing the school premises, and in maintaining school discipline. Nay, if the masons, carpenters and smiths of the neighbouring suburbs or villages work at the school house, let the children assist them, as far as may be, and learn. If the weavers supply clothing, let the pupils go unto them and learn their work also as far as may be. Let the children be made to see how the various trades, callings and professions contribute to the life of the school community and realize, that it is such co-operate effort that makes for the well-being of the larger community. There is much to be learnt from the Tuskegge Institution, the George Junior Republic and other educational organizations of America which have been turning to excellent account co-operative and civic principles. It must never be forgotten that true education consists in realizing at every step how our training and information have organic connection with our surroundings.

IV. *The revival of an old idea.*—To attain the very best results in Education, an amount of seclusion from the dust and din and distractions of city life, is desirable. An ideal institution should be situated a little way from the city but not away from human life. It must be surrounded by hamlets or suburbs of people engaged in various occupations who could be visited by the pupils, as often as practicable. The need for such retirement is felt particularly in the

case of High Schools, Colleges and Universities. This is an old Indian idea, which is now being largely adopted in the West.

V. *Holidays and Excursions.*—Excursions may be made either to the city or to the country. The latter demands our special attention. They ought to be systematically arranged at every one of *the four seasons*, Spring, Autumn, Rains and Winter, when nature bears marks of perceptible change in her moods. Such days as are most characteristic of the seasons must be fixed and plans laid out for taking the children of *all* schools out. The teacher should create for the pupils interest graduated according to their standards. The higher the grade the more spiritual, the more poetic and the more scientific must be the interest.

It is very desirable that the adult population also should be encouraged to make holidays of this kind in *each of the seasons*. Special portions of the forests, wooded lands, and banks of rivers in the neighbourhood should be marked out for this purpose.

Hindus as well as Mahomedans have had such longings in them, but modern life is killing their love of communion with nature. The cultivation of the emotional side of man, weeding out the base passions, is far too much neglected so that we find ourselves more and more in the grip of materialism.

A factory for extracting oil from alum schist has been started in Sweden. Large quantities of this schist, yielding benzine and crude oils are found in the Lamma Nerika district. The crude oils, according to the *Teknisk Ukeblad* of August 30th, can be used for oil engines or converted into paraffin and lubricating oils. The factory is capable of treating 30,000 tons of schist per annum, giving 1,200 tons of oil. The supply of schist in Sweden is practically inexhaustible, and other factories will be erected shortly.

RECONSTRUCTION IN GREAT BRITAIN.

By Arnold Wright.

SLOWLY, very slowly the problems of reconstruction are being grappled with. Peace hath her difficulties not less formidable than those of war is an adaptation of an old adage which is daily forcing itself upon attention. On all sides troubles are developing which it will require strong statesmanship and exceptional foresight to dispose of satisfactorily. Never before, indeed, has the Government of this country been called upon for the display of a larger measure of these qualities. The demobilisation of seven million men implies a colossal effort in every branch of the administration and a corresponding disturbance and readjustment of the conditions of civil life. But with goodwill on the part of the community and the full exercise of the golden virtue of patience there is no reason to fear the ultimate outcome of the existing confusion. For one thing the economic position of the country and of the Empire is sound. In spite of the tremendous efforts that have been, the unprecedented expenditure of money and the equally unprecedented sacrifice of valuable lives the national credit and the national power to advance are unimpaired. The war has been a hard teacher but its lessons have been thoroughly acquired. In industry especially we have progressed enormously beyond the front at which we stood at the opening of the great war. Our scientists and inventors have worked to good purpose in almost every branch of production. New processes and improved equipment have revolutionised our systems of manufacture in many instances and it is not too much to claim that Great Britain to-day stands at the head of the great manufacturing nations of the world in all the vital elements of business. Until our war machinery has

been fully converted to meet the needs of peace the full effect of the revolution that has been worked will not be revealed. But the air is changed with the inspiration of a new hope which is pleasantly apparent amid the turmoil of Bolshevist anarchy.

The message of the New Era for India is one as hopeful and inspiring as that which it is conveying to the Empire's centre. The old order is changing giving place to the new. Industrial eminence is assuredly hers if she applies properly the teachings of the time and puts to full use her matchless resources. In steel manufacture, coal production, the working of leather, and a score of other important branches of activity she has an assured future if she rises to the greatness of her opportunities. That she will do so is hardly to be questioned. The enlightened enterprise which created the Bombay Cotton Manufactures and the great steel undertaking of the Tatas will find vent in new directions and result ultimately in a truly national industry second in importance to none in Asia. But if there is to be the rapid progress that all friends of India desire the educational system of the country will require to be brought more into harmony with modern needs. Technical schools will have to be multiplied, practical science given a more prominent place in the university curriculums, and more direct official aid must be given to nascent industries. At the same time there must be a change in the Indian attitude towards manual processes. It must be as great an object of ambition to be a skilled engineer or an efficient craftsman as to be a successful pleader or a well paid official. Young India like young Britain must equip itself with greater scientific efficiency for the new struggle upon which we are entering for commercial supremacy. The day is past when any country can be great by living in the past. The future belongs to those who can turn to the best account the resources of nature and unravel most effectively its still unrevealed secrets.

If I were asked to indicate the two principal directions in which development would proceed in the immediate future I should name aerial navigation and the manipulation of electrical energy. In both respects the coming years hold boundless possibilities. The science of aviation is yet in its infancy but we read in the current issues of the press of a non-stop journey of 6,000 miles of a Zeppelin airship and practical talk of services which will connect the uttermost ends of the earth by aeroplanes which will traverse the longest distance in a few days. The time is undoubtedly coming when India and England will be linked by a fast service of aeroplanes which will bring the two within the range of a forty-eight hours communication. Electrical development is still not so conspicuous, but there are plans in process of fruition which will effect a wonderful change in all the relations of life. The utilisation of water-power for the generation of energy, perhaps, offers the most brilliant prospects. While in most countries there are abundant facilities at present not availed of for hydro-electrical enterprize India presents an almost unique field for this type of work. In the South as well as in the North there are untold millions of gallons of water running to waste. The harnessing of this surplus power and its application to the needs of man is a problem which it will be easy to solve if the governing authorities render the necessary initial aid. Some day probably not far distant we shall see industrial India almost completely supplied with essential power for working its machinery from hydro-electrical installations posted at convenient centres for distribution from the Himalayas to Cape Comorin. Nor will it be necessary probably to rely entirely upon the rainfall for the means of creating energy. Scientific opinion is awakening to the possibilities of using sea water along the coasts for hydro-electrical work. In a recent number of the Engineering Supplement of the *Times* there appeared an elaborate article showing how tidal waters could be utilised for driving turbines. Along the Indian coasts both in the West and the East there are numerous points at which hydro-electrical apparatus could be installed on these lines. The subject is one of

tremendous importance and it should be some body's duty to investigate it as far as it affects India with a view to practical development for the benefit of infant industries.

Manufacturers in every important district are making their preparations to take advantage of the boom that is confidently expected in trade as soon as the Peace treaty is concluded. There are everywhere immense arrears awaiting attention and especially in that special department of industry which is concerned with railway equipment. Not merely in the war devastated areas of Europe are the demands great and insistent for new rolling stock but in almost every country of the world which before the war relied upon Europe for the satisfaction of its needs. I am told that some of the waggon manufacturing concerns in this country have orders in hand already which will keep their factories occupied fully and continuously for two or three years. Railway waggon construction before the war was largely engaged in by German firms, but there is little likelihood of their resuming operations for some considerable time to come owing to the lack of raw material and the disturbed conditions of the country. The United States, however, are likely to prove a formidable competition for trade with British firms. At the same time the demands to be satisfied are so vast that at present at all events the encounter gives rise to no anxiety. India has in recent years been a manufacturer of rolling stock for her own lines, and there seems no reason why she should not lay herself out for a share of the foreign trade. In Mesopotamia at all events there is a field which seems to be peculiarly adapted to her capacity. In that country there will be a very large demand for rolling stock for a long time to come and enlightened self interest seems to require that India should take steps to meet it. The Mesopotamian Railway system must in time be one of the most important in Asia. Looking not very far ahead we may see it linked up with the Indian system and constituting one of the great land routes from the West to the East. On all grounds it is desirable that the connection formed with the construction of the system in war should not be broken now that peace is here. In a real sense Mesopotamia is a permanent sphere of influence of India.

THE DEVELOPMENT OF AGRICULTURAL ORGANIZATION.*

BY SIR R. HENRY REW, K.C.B.,

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THE advantages which farmers would gain by combination for their mutual interests have long been recognised in theory bnt very imperfectly realised in practice. For certain purposes, indeed, farmers have long shown, some readiness to combine. There are hundred of societies and clubs throughout the country many of them of considerable antiquity which exist mainly for the improvement of farm stock. No doubt many of them are supported by large landowners and others interested in Agriculture, but they nevertheless include a large proportion of tenant farmers, who have associated themselves together for practical objects. Combination of farmers for their general interests as a class has also had partial success, in the Central Chamber of Agriculture and the Farmers' Union. But it, nevertheless remains true that the farmers are reluctant to combine, and that if for a time they are induced to do so they are apt very quickly to fall away. Under the influence of pursuasive eloquence, or the stimulus of some political grievance, they may join an association, but when the second or third subscription falls due they begin to ask what they are getting for their money—a question to which a very definite answer is not always immediately obvious. Altruism is not a characteristic virtue of any class of Englishmen, and it is perhaps especially inconspicuous among farmers. The British Farmer is very practical person, with a

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trong tendency to individualism and a ooted objection to unremunerative outlay.

It is now about a quarter of a century, fter some experience of agricultural organization in different phases, I became convinced that a national Association of Farmers on a scale commensurate with their numbers as a class, and their importance in he country, was only feasible if direct commercial objections could be combined with more indirect political and economic objects, to which attempts at establishing uch associations had generally been restricted. The really powerful class organizations n this country are those which offer pecuniary advantages to their members, as well as the more impersonal benefits to be attained, by joint action in the interests of their class. I used such influence as I then had with the Chambers of Agriculture to induce them to take up the question from this point of view. Two committees explored the subject in considerable detail, and the report which was presented in 1898 on Co-operation for the Sale of Agricultural Produce attempted to sum up the position as it then appeared and recommended the establishment of a "Co-operation Section" of the Central Chamber of Agriculture. That Proposal was supported by many of those who at that time were among the most farsighted leaders of Agricultural opinion, and, if it had been possible to develop it, the initial difficulty of enlisting the aid of the larger farmers in promoting the principles of Agriculture Co-operation might possibly have been overcome, and the whole movement might, perhaps, have been accelerated. The organization of the Chambers of Agriculture then, as now, comprised a large number of local bodies, which varied a good deal in the scope of their operations, and some of them, at that time had adopted the principle of co-operation in one form or other—usually for the purchase of farming requisites. It appeared that by the process of building up on existing foundations the adoption of the principle might be gradually extended throughout the country with the assistance and support of those who were recognized as the leaders of the Agricultural Community. There were obvious objections and difficulties attaching to this mode of procedure, and it may be that the establishment of a new and independant association was the better course. A year or two after, the late Sir R. Yerburgh, who was a member of the Committee of the Chamber of Agriculture and approved its Report, and established the Agricultural organization society which has now become a powerful and widespread association. The position which it has now attained and the work it is doing, are indicated by Mr. Leslie Scott aud Mr. Acland in the papers which appear in this number of the Journal. It may be noted that the initial difficulty referred to above still remains, although, thanks largely to Mr. Scott's own energy and enthusiasm, the interest and assistance of larger farmers are now being rapidly enlisted in the movement.

In numbers what may be termed large farmers are more limited than is sometimes realised. There are 51,767 holdings of more than 158 acres in England and Wales, of which no more than 14,126 exceed 300 acres. But the influence of these farmers is not to be measured by their numbers. Each of them is in a large degree an example which those who occupy smaller farms attempt to imitate, for the tendency of even the small holders to copy the methods and practice of the larger farmers in the District—sometimes quite unsuitably and unwisely—has often been remarked. No doubt it is difficult to bring the large farmer and the small holder on to the same commercial plane, but the problem though difficult, is not insoluble, and if farmers themselves assist there is good reason to believe that the Agricultural Organization Society can and will, solve it.

The principles stated in the Report to which reference has already been made, are generally accepted. While co-operative purchase of farming requisites is easy, co-operation for the sale of produce is very difficult. The advantage of association of producers in particular districts for the joint disposal of certain classes of produce is particularly marked in the case of farm produce subjected to a process of manufacture such as the conversion of milk into butter or cheese, the curing of bacon, or the making of jam. Co-operation for the sale of live stock and for the sale of milk had, twenty years and more ago, been undertaken with success. The tendency, both at home and abroad, for Co-operative Association it is specialised—that is to confine their operations to a particular kind of produce appeares to continue, and probably affords the best if not the only, means, in most cases, of getting the co-operative principle accepted in a district, leaving the linking up of specialised societies to a latter stage of development.

It is a platitute that British Agriculture, with the British nation, and indeed the whole world, is entering a new era, of which all that can at present be said, with certainty, is that the conditions will be different from any which have previously existed. Whatever the future may bring, however, it is clear that farmers will find combination not less necessary than before, and that in developing that form of it which is commonly known as co-operation, they will be wise in their day and generation.

It is announced for general information that for the present licenses will be freely granted for the export of all oilseeds and vegetable oils, except to certain destinations in Europe. Full particulars may be obtained from the Collectors of Customs at the various ports.

LAC CULTIVATION IN MYSORE.

BY RAO SAHEB M. RAMA RAO,

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LAC cultivation is carried on in Mysore for over half a century. The first mention of it is found in the Forest Annual Report for 1866-67. From the year up till 1892-93, areas containing *Jalari* trees (Shorea Talura), the only species on which lac is cultivated in the State, were farmed out to private contractors. From the latter year up till 1916-17, it appears to have been partly cultivated by the Forest Department and partly by private lessees. Since 1916-17, all the lac producing Jalari areas have been leased out. The cultivation is carried on in the Mysore, Bangalore, Kolar, Tumkur and Hassan Districts. Some attempts seem to have been made to introduce it in the Shimoga and Kadur Districts in the later nineties, but were not persisted in probably due to unsatisfactory yield of lac.

Information available on the annual quantity produced and revenue realised is very meagre and fragmentary. The yield of Departmental cultivation is recorded but that of private lessees finds no place in the reports. 965 local maunds (28 lbs. each) equivalent to 12 tons of lac was the highest recorded yield in 1901-02. The highest revenue realised was Rs. 8,323 in 1906-07. It has gradually fallen ever since to Rs. 814 in 1916-17.

The Trade returns of 1913-14, 1915-16 and 1916-17 show that 900, 951 and 1,011 maunds of lac were exported, while the imports were 300, 411 and 384 maunds respectively. Assuming the imports to represent local consumption and exports to represent local production, the annual output may be taken at 1,000 maunds.

The price of lac during the same period was well above Rs. 21 per Bengal maund

r Rs. 7 per local maund, except during 915-16, in which it fell to about half of the bove figure. These figures do not explain he fall in revenue to Government during ecent years.

There is no reliable account of annual onsumption of lac within the State, though here is reason to believe that an appreciable quantity is used by Goldsmiths, Copper and Brass-smiths, by Native Physicians, Bangle-makers, for sealing-wax, etc. As already stated, we may roughly assume the quantity imported annually to represent the local consumption.

There is no detailed record of all the Jalari areas available in the State, the areas that are at present utilised for lac cultivation and those hitherto unutilised but suitable for the purpose. Such information has to be collected in all the Districts and permanently recorded, and the existing Jalari areas indicated on Taluk, and Village and Forest Range maps. There is no doubt that there are large patches of Jalari jungles which have not been hitherto used for lac cultivation, as some instances of which may be cited. Jalari tracts in Chamarajanagar, Berambadi, Ainur-Marigudi, Kakankote and Mettikuppe forests of Mysore District; District Jungles round about Narasimharajpura, Kusgal, and Mudigere Forests in the Kadur District and some forests of the Nagar Taluk of Shimoga District. In Jalari tracts of heavy rainfall, the lac-insect may not thrive at first, but when gradually introduced and acclamatised, it is likely to thrive and produce lac there just as well as in the maidan tracts.

The present method of cultivating lac on the Jalari tree in the State is more or less similar to the cultivation of *Kusam* and *Palas* lac in the Central Provinces. A description of the latter method is given in Mr. Avasia's printed note on "Lac and Lac Cultivation," and Mr. Lowrie's note on "Propagation and Collection of Lac." The following is a brief account of it.

The trees to be infected are first selected, very old and stunted trees being rejected and vigorous ones with healthy branchlets being marked for infection. Trees growing close together in a dense mass are also avoided, as lac-insects do not thrive on them for want of free play of air and light. All dead branches and branchlets on trees selected are removed. In the case of trees with few young branchlets, or in which the branches are stunted and moribund, such branches are lopped or pollarded at least one year before the propagating season, to encourage the growth of sappy shoots. At the forks of branches four to six feet below the young shoots, small bundles of mature encrusted sticks in which the young larvæ of the lac insect are about to crawl out of their shells, are tied. This is called the 'brood-lac.' A bundle may contain four to eight or twelve sticks depending upon the size of the lac incrustation. The number of bundles tied on to each tree depends upon the size of its crown, the larger the crown the greater is the number of bundles used. They are generally tied on the branches on the windward side of the crown, so that insects blown by wind may be caught up by the leafage of the crown and crawl on to branchlets instead of being blown off the tree and killed. The young insects crawl up branches for a length of even ten feet to get the young branchlets.

After the sticks are tied, the insects emerge out of their resinous shells and crawl up to the young branchlets and fix themselves on the sappy bark and suck the sap. This crawling out or "swarming" as it is called, may last from fifteen days to a month, at the end of which the original resinous incrustation will become empty of all young insects.

The insects remain stationary on the branchlets and make a thin shell round themselves by a red resinous fluid which they secrete. This shell gradually thickens by further secretions of the insect and

becomes the lac incrustation. When the male insects mature about two months after infection, they crawl out of their shells to those of the females and impregnate the latter and then die out. The females remain in their shells, increase in size losing their legs, and become rounded sacks. When the eggs mature and young larvæ are formed, these latter swarm out of the mother insect, which then dies. The life of the insect from the first infection to the "swarming" out of the next generation is about six months. Just about the time the swarming begins, the incrusted branchlets are cut and about a fourth of the quantity is employed as brood-lac for the next crop.

If the crop is poor owing to adverse causes such as drought, fires, heavy rains, attacks of predacious vermin, the incrusted branchlets are left uncut, so that the young insects in them may spread out to fresh branches and form a good crop for the next harvest. The foregoing adverse causes sometimes ruin the entire crop, thereby causing not only heavy loss but also necessitating of brood-lac from elsewhere for cultivating the next crop.

The cutting of the incrusted branchlets in harvesting the crop serves as a pruning for the trees which put on fresh shoots for the raising of the next crop.

The bundles of incrusted sticks used as brood-lac are collected together after all the young insects crawl out of their incrustations. They form the '*stick-lac*' of commerce but are not generally sold as such. The sticks are taken home and the resinous incrustations removed and dried thoroughly in shade after removing pieces of wood, bark or other foreign matter, and then sold.

Two crops of lac are raised annually one in May—June and the other in November—December. The seasons may vary by about a month by climatic changes which retard or quicken the 'swarming' period. The time of harvesting of a crop is also the time for the sowing of the next crop, since the harvested incrustation is used as the brood for the next crop.

This is said to depend upon the quantity of brood-lac used, the number of vigorous and healthy branchlets in a tree, the size of the crown of the tree, climatic conditions, and the immunity or otherwise of the incrustations from the enemies of the insect, etc. An experienced old Vaddar who was employed in lac cultivation for over thirty years in Melkote Forests informed the writer that a yield of *four* times the quantity of brood-lac used is a good crop. The average yield in Bangalore District is stated to be about five seers of twenty-four tolas per tree or about 3 lbs. The average yield of Palas lac (Muttuga) in Central Provinces is about the same.

From the writer's observations of the operations of lessees in the Narayanadurga Forest of the Mysore District, and Kariyappanahalli and Puttenahalli District Jungles in the Bangalore District, he is of opinion that the lessees do not take as much interest in improving the methods of cultivation as they ought to. The trees are not pruned sufficiently early to produce strong and healthy shoots before infection; the brood used for propagation is not carefully selected from the healthiest and largest incrusted branchlets, nor is the quantity used always adequate. Not infrequently, the infection is started late, when some of the young insects have crawled out and died. The pruning is done with blunt knives resulting in the bark being torn away from the wood, thereby preventing or retarding the growth of vigorous shoots. The cultivated trees are not constantly watched and the crop freed from squirrels, ants, and other vermins that damage the incrustations and the lac-insects. They employ inadequate and ill-paid staff who take little or no interest in their work. The lessees are men of small means and live far away from their lac farms. They do not seem to adhere rigidly to any regular rotation in selecting areas for cultivating

ch year's crop so as to give sufficient st for the tree and time to produce ealthy shoots for the next crop. They do ot take sufficient trouble to clean the crude c of impurities and to convert it into rain lac' before placing it in the market, nd consequently they get low prices for eir produce.

SUGGESTIONS FOR EXTENSION OF PRODUCTION.

As already stated, there are no reliable gures of the annual production of lac in the State. Judging from the highest yield reorded in 1901-1902, and from the exports of hree recent years, it is assumed to be about 1,000 maunds. This annual yield of 1,000 naunds is very poor and highly incommensurate with our vast resources of lac-producing indigenous trees. We have not only the Jalari trees occuring in greater abundance than is now utilised for lac cultivation, but we have also tons of thousands of *Sagade* trees (*Kusam* of Central Provinces), *Muttuga* (*Palas* of Central India), *Chatte* (*Ghont* of Central Provinces) and *Kari-Jali* (*Khiker* of Sindh) occuring in various parts of the State and capable of producing much larger quantities and finer qualities of lac than that of Jalari.

Experimental cultivation of lac on some *Sagade* trees in the Lakkavalli Range in the beginning of 1918 from brood obtained from the Central Provinces having resulted in fair success, the resulting brood was again used in June 1918, for propagation on new trees and a second brood was harvested towards the end of last December, and this has again been used to propagate a third crop of locally raised *Kusam* lac. Although the quantity of new *lac* collected at each harvest was small owing partly to preventable causes such as attack of squirrels and black-ants, and lac of careful and constant watch over the infected trees and partly to the new environments of the brood-lac, yet the results show the probability of commercial success by persistent efforts and well organized and efficient conduct of the propagation operations. In size and colour, the lac incrustations of both crops locally raised compared quite favourably with the incrustations of brood-lac received from the Central Provinces. From the first-harvested crude lac, excellent dye and sealing-wax were prepared in the Central College by Professor Srinivasa Rao. The writer picked up an appreciable quantity of pieces of lac under the infected trees six months after the harvest had been made by the local Range Officer, the pieces having dropped down by the damage caused by squirrels before the first harvest. In some cases, wild fire had swept over the ground under infected trees and melted the fallen *lac* which had stuck to fallen sticks and grass and appeared like globules of amber. The lac-insect is very susceptible to serious injury by fires, and hence the mention of the above incident.

The above facts point to the possibility of extending lac cultivation in the State by :—

(*a*) Taking up larger *Jalari* areas for the purpose;

(*b*) Introducing its propagation on *Sagade* trees (Schleichera trijuga), which occur largely in the high deciduous forests of Mysore, Kadur and Shimoga Districts;

(*c*) *Muttuga* trees (Butea frondosa) found in malnad and maidan Districts;

(*d*) *Chotte* or *Chatte* (Zizyphus xylopyrus) trees found in all Districts, both in scrub and high deciduous forests. Regarding this tree, Mr. W. A. Fraymouth, Managing Director of the Esociet Co., Maihar, says that it is the best species for producing lac in certain parts of Central India chiefly Central Provinces, that the colour of the lac is good,

that the trees require no extensive pruning and that the cultivation is easy.

(e) *Kari-Jali* (Acacia arabica) found in large masses in certain tank beds in many maidan and malnad taluks, particularly in Chitaldrug District; and

(f) Other indigenous species such as *Elachi* or *Borai* (Zizyphus Jujuba), *Arali* (Ficus religiosa), *Atti* (Ficus glomerata), *Ala* (Ficus bengalensis), all of which occur more sparsely and isolated than the foregoing five species.

On the first three species lac is propagated extensively in Central India, and on the last in Sindh. The average annual figures of export of lac produced chiefly on *Sagade* and *Muttuga* trees in Central Provinces during 1904 to 1907 were 67,238 cwts. (3361.9 tons.) valued at Rs. 33,18,687. In Sindh, large quantities of very good lac are produced on Kari-jali trees every year. In 1907 revenue realized in one Division alone by leasing out the lac-producing areas was Rs. 85,000.

With these facts before us and with the result of the experimental cultivation of Sagade referred to above, and the successful formation of lac incrustations on a Muttuga tree in the Bangalore Jail compound by Jalari brood-lac experimented with last year by the Director of Agriculture, there is every reason to believe that by persistant efforts lac-cultivation can be so extended as to form an important industry yielding very handsome revenue to the State and income to the people.

For the introduction of lac cultivation on the above mentioned species other than Jalari, it is necessary for Government to take the initiative by starting experimental cultivation under the control and supervision of an earnest and enthusiastic officer from brood-lac obtained from North India; the locally raised brood thereform should be used successively generation after generation until the lac insect is well established and acclamatised to the varying climatic conditions in which the several kinds of trees are found. After thus establishing its successful cultivation the industry should be gradually left in the hands of willing and enterprisiug ryots of neighbouring villages. Excepting the cost of brood-lac, the propagation of lac is a simple and comparatively inexpensive one, quite within the means of our ordinary ryots. For the first few years, they may need help in the supply of brood-lac, and advice in the methods of propagation, harvesting, working up of the crude-lac into "Grain-lac", and its disposal. When once they realise its simplicity and profitableness, they may be depended upon to take to and continue the cultivation quite eagerly as do the ryots of some of the Central Indian tracts where lac is propagated.

When the quantity of lac produced is sufficiently large in the country, one or more central factories for refining it and converting it into shellac and for manufacturing lac-dye if there is a market for it, will come into existence.

What is wanted is earnestness, enthusiasm and great patience and persistent efforts in introducing the cultivation on the several species of trees named above and to continue the experiments, without being damped by any failures or by partial successes at first, until the industry becomes well established. Repeated experimental cultivation for *four* or *five* years during which two crops annually can be obtained, will be sufficient to establish the industry successfully or to prove that it has no chance of success. In the writer's opinion, the industry is bound to succeed, as all the conditions favourable for its successful establishment exist in the State.

For successful introduction of lac propagation on new kinds of trees, and for

easing the output of the indigenous iri-lac, the following measures should be pted:—

1. All *Jalari* groves in the State should be explored, their limits and their areas defined and marked on maps.
2. A period of rotation, say three years, should be rigidly enforced. A grove cultivated with lac in one year should be allowed three years' rest before being infected again. To ensure this, *Jalari* tracts should be divided into regular blocks and each block operated on systematically once in three years.
3. The trees to be infected should be cleared of all dead branches and branchlets, and stunted and stag-headed branches should be pruned with sharp knives. This should be done simultaneously with, or immediately after harvesting the lac crop, to enable healthy branchlets to be produced for the next rotation. This systematic pruning is essential for production of healthy brood-lac.
4. Brood-lac twigs should be selected and cut from large sized and healthy incrustations in time to prevent loss of insects by swarming out and dying before infection.

   If the resinous lac is the sole object of the cultivation and not the lac dye also, the utilization of all the harvested lac twigs for brood-lac of the next crop, and the collection of the twigs after the insects swarm out is advocated by Mr. Fraymouth, as the lac on the twigs would then be almost free from coloring matter and organic impurities of the lac insect and other predatory insects which will have disappeared by exposure on the trees. This is said to effect much saving of expense in getting rid of the coloring matter and organic impurities and to fetch a much higher price for the lac.
5. Infected trees should be protected against monkeys, squirrels, ants, larvæ of predaceous insects, especially *Eublemma amabalis*, and other causes of injury such as fires and thefts of lac-twigs, The first two may be trapped. or scared away by bamboo rattles. Ants are said to be kept out by applying a thick solution of ground yellow arsenic (*Haridala*), mollasses and water round the infected trees, and Mr. Fraymouth advocates a band of tar round the trees. No direct means of destroying the larvæ *Eublemma* appears to have yet been found out. Mr. Troup recommends harvesting of lac twigs from trees before swarming and tying them in bundles directly to the trees to be infected and removal of the bundles immediately the swarming is completed, so that the emergence of the predaceous moths, which generally takes place some time after swarming, may not occur on the infected trees ; this saves the young crop of insect from the larvæ of the moths which will have no opportunity to lay their eggs in them. The lac removed must be immediately ·ken away and dried by fumigaon with Carbon Disulphide or onverted into grain-lac, so that ie predacious larvæ in it may e destroyed before the moths

are formed. Fires should be prevented by regular fire-protection operations. Thefts can only be prevented by constant watching of the infected trees for about a month at the commencement until the brood-lac bundles are removed after swarming and for about two months before harvesting the new crop.

Cultivation on Sagade, Muttuga, Chotte and Kari-Jali Trees.

6. As suggested for Jalari groves, the areas on which each of these species occurs in groves or large patches should be ascertained, defined on the ground, and correctly indicated on Taluk, Village and Range maps. They should be divided into annual blocks of three or a multiple of three in each locality, so as to admit of lac-infection on a rotation of three years to start with, until the most suitable period of rotation is ascertained by actual experience.

7. In selecting trees for infection, young saplings should be avoided. The branches of trees selected should be pruned so as to get their crowns rounded and to produce the largest number of healthy and sappy shoots. Mr. Lowrie of Central Provinces advocates this in his note, especially in the case of Sagade, for the reason that "by so doing, the maximum of incrustations is obtained for the size of the tree."

8. Lac cultivation on these trees being unknown in the State, no contractors or ryots will take to it until it is started and demonstrated, by experimental cultivation, to be profitable. This has to be done by the Forest Department which commands the requisite facilities.

9. The areas selected for the experiments should as far as possible be similar in climatic conditions to those where lac is now produced in Central India on those kinds of trees. In the writer's opinion, forests near Lakkavalli in Kadur, aud Veeranahosahalli and Mettikuppe forests in Mysore district possess the requisite conditions for starting the experiments on *Sagade, Muttuga and Chotte* trees. For experiments on *Kari-Jali*, a dry locality where that tree occurs in groves, may be tried.

10. An earnest and enthusiastic trained Forest Officer possessing practical knowledge of the methods of raising Jalari-lac in the State should be put in charge of the work, under the control of the District Forest Officers. He should be given a small staff to conduct the operations and to carry out the experiments efficiently.

11. It being a well recognised fact in the Central Provinces that lac infection in forests not previously cultivated with lac is very uncertain for the first two years, failure, or poor crop in the earlier stages of our experiments, should not be allowed to discourage the attempt. The cultivation should be persisted in, all possible care being taken in previously pruning the trees, in selecting healthy brood-lac and applying it in the

proper time, in protecting the infected trees against its numerous enemies and in watching the crop constantly.

12. The experiments should be continued for four or five years the brood-lac being first obtained from Central and Northern India, and subsequent experiments being made with the brood raised locally therefrom in successive crops—until the lac insects on the several species get acclamatised to our local conditions and become well established. As already stated we have raised two generations of brood-lac locally on Sagade from the stock obtained from Raipur in the Central Provinces and the third generation is expected to mature in June next. The yield was poor owing to several causes, some of which preventible, but that should not lead to the abandonment of the experiment, or to the premature publication of a dishertening account of it, as has been unwittingly done already.

13. If the experimental cultivation proves a success, of which there is no reason to doubt, then regular cultivation on a commercial basis may be left to local private agency, the areas to be cultivated by each person being specifically defined. Every encouragement and facility should be given to such persons at first by supplying them brood-lac at a low cost fixing Government share of lac or royalty low for the first few years and gradually raising it to the normal rate with reference to the quantity of lac produced or number of trees operated on.

14. The lac areas should be given out on long-term leases so as to ensure the cultivators taking abiding interest in the industry.

15. Frequent inspections and supervision of all lac farms in the State by a Government Officer who has acquired expert knowledge of lac cultivation by a course of practical training in Central India at Maihar and Pusa and by conducting the experimental work in the State, should be provided for, free of charge to the cultivators.

16. The Government may also help the cultivators to secure a fair price for their produce by buying up the crude lac annually at the ruling market rates and refining it in a Central Factory of its own, before disposing of the refined article at a profit. Should there be a demand for lac-dye, it may also be prepared in a Factory. The cost of establishing a factory for preparing lac dye and refined lac or shellac is not likely to be heavy, as the machinery required could be easily made in the Industrial workshop or procured in India at a modest cost.

AGRICULTURE IN THE UNITED PROVINCES, 1917-18.

BY "RUSTICUS."

Mr. Hailey, the Director of Agriculture in the United Provinces, can always be depended on for an interesting report on the work of his Department, in which the facts are stated fully and frankly and are not coloured by any personal predilections on the part of the writer. The Agricultural Department in the United Provinces has suffered very severely during the last four years owing to the claims of the war on its superior staff but, none the less, much sound work has been done and, now that the war is over, rapid progress may be expected. It is evideut from the Local Government's review of the Report which is far from being what such reviews so often are, a bald summary of the salient points of the Report, that it is fully alive to the importance of agricultural development and that Mr. Hailey will have a first claim on such funds as may be available. A very considerable expansion of the staff of fieldmen and of that of farms has already been arranged and more money will be allotted for this object as soon as possible, the ultimate aim being to provide a farm for every *tahsil* in the Province. The principal object of these farms is to be the dissemination of the knowledge and practice of improved methods of agriculture but they will also be used to test the suitability of new varieties to the conditions of the districts. Although this increase in farms is in prospect, it is clear from the fact that demonstrations of various kinds were carried out iu 989 villages of the Central Circle and some 2,000 were given in the Eastern Circle that the Agricultural Department in the United Provinces has not lost sight of the effectiveness of demonstration on cultivators' own land. As we have frequently pointed out in these columns, for one intelligent cultivator who is willing to adopt methods which have proved successful on Government farms, there are ten who decline to be convinced of the superiority of those methods until they see them carried out, not on their own land but on that of their neighbours. They are apt to be suspicious of work on Government farms and to think, quite wrongly, that considerations of expense are never heeded and that, therefore, such work has no bearing on their own conditions.

The three crops on which most work has been done in the United Provinces are wheat, sugar-cane and cotton. The Agricultural Department is now, however, devoting more attention to rice, millets and gram. The Local Government emphasizes the importance of improving the yield and the quality of the two latter crops, in view of the important part they play in the diet of the bulk of the people. Comparatively little work has been done on them anywhere in India so that the United Provinces are not specially backward in this respect. Two Pusa varieties of gram, Nos. 17 and 18, are now giving satisfactory results and there is a demand for the seed of selected varieties of *juar* (*jola and bajra kumbu*) with which the unfavourable seasons for these crops of late years in the Provinces have rendered it difficult to comply.

It is interesting to find that the Agricultural Department has been almost too successful with sugar-cane. The crops of the medium sized varieties it has introduced, J 33, Mauritius and Uba, were so heavy—twenty to twenty-five tons per acre being obtained in some cases against the usual average of eight to ten tons—that considerable difficulty was experienced in disposing of them with the existing crushing appliances. This is evidently a matter in which agricultural and industrial development must go hand in hand, and if the heavy yields have come to stay, as there is no reason to doubt, there

is every prospect of success in the United Provinces for factories equipped with modern crushing plant. It is a field to which Indian capitalists might well turn their attention.

The Pusa Wheats Nos. 4 and 12, and the Cawnpore variety C 13 continue to spread in the United Provinces and some 35,000 maunds of seed of these varieties were issued in the Central and Eastern Circles. Mr. Hailey estimates the difference in yield between them and the ordinary varieties, when grown under the same conditious, at three to four maunds an acre, so that the introduction of the new varieties has made no small addition to the food resources of the Provinces. The Department is now endeavouring to find a wheat better suited than the Pusa wheats to tracts in which labour is scarce and a beardless wheat is much subject to the depredations of birds. Mr. Leake, the Economic Botanist, has made some progress in tbis direction but the type he has isolated has not the same immunity from rust as the Pusa wheats.

In the case of both wheat aud sugar-cane, Mr. Hailey considers that even more is to be expected, in regard to increased yields, from improvements in cultivation than from the introduction of improved varieties. The mere replacement of ordinary wheat or sugar-cane by a better variety is not sufficient unless it is accompanied by more intensive cultivation, particularly the better opening up and cleaning of the soil. If the importance of good cultivation is not realized, an unwarranted disappointment is sometimes felt at the outturns of the new varieties being smaller than was expected.

The year was an extremely bad one for cotton owing to abnormally heavy rain in September. This was specially unfortunate as it deprived the Indian Cotton Committee, which visited the Provinces towards the end of 1917, of much valuable material. No tests could for example be made of the hybrid varieties Mr. Leake has evolved at Cawnpore. Such results as were obtained were encouraging from the point of view of those who wish to see more long staple cotton grown in India. The American cotton crop yielded rather better than the indigenous varieties, whilst, for the first time on record, the price obtained for it was *much* better, a premium of Rs. 4 per maund of unginned cotton being obtained. There was, however, a certain element of artificiality about this price, for the whole crop was purchased by the Agricultural Department and, after ginning and pressing, was sold by it on the open market. Obviously this system can only continue as long as the crop continues a small one and, if it increases, some other method of dealing with it will have to be found. The Local Government suggests that Co-operative Societies should take over the work. A beginning has been made in that direction in the Punjab and Bombay but co-operative sale of produce demands qualities of a somewhat different order from those involved in the successful supply of credit. That, however, is a subject which is beyond the scope of this article.

One interesting reaction of the war on the agriculture of the United Provinces was the extension of the area under castor, the oil of which was in demand as a lubricant for aeroplanes. The rotation experiments are worthy of mention. They are specially important owing to the large area in the Provinces which is cropped twice in the year and the necessity of growing a fodder crop in the thickly populated districts. It has now been established that a fodder crop of *juar* (*jola*) can be successfully followed by a quick growing wheat, provided the first crop is properly manured and the land is cultivated with an iron plough and harrowed. The value of manure is also strikingly demonstrated by the large yields of wheat—25 to 30 maunds an acre which have been obtained on the farms in the Eastern

the maize has been sufficiently manured. These experiments entirely corroborate Mr. Hailey's contention that improvements in agricultural practice are an even more important factor in securing increased outturn than improved varieties.

The interest taken by the Talukdars of Oudh in agricultural development which has led to the establishment of numerous private farms has been mentioned in our previous reviews of Mr. Hailey's Reports. This interest is now extending to land improvement. On one large estate, the installation of a pumping plant and the construction of the necessary masonry channels is transforming several thousand acres of sandy waste into good culturable land. On two other estates, land hitherto unculturable owing to the efflorescence of alkaline salts, *usar* land as it is called in the north of India, is being reclaimed.

The Agricultural College had a successful year. It has now as many students as it can conveniently hold and is beginning to find itself cramped for laboratory room. The two years' vernacular course is becoming increasingly popular. As the teaching of practical agriculture is the main feature of this course, this is satisfactory as it evinces a genuine demand for agricultural education for its own sake and not as an avenue to Government service. That is hardly the case with the diploma course, for of the nine students who formed the first batch to pass out, no less than seven obtained employment under Government either in the Agricultural or the Education Department. The recent discussions in regard to agricultural education in this country have at last borne some fruit and a middle school for agriculture will shortly be opened in the United Provinces for boys of 15 to 17. It is intended mainly for the sons of the smaller landholders and the larger tenants with occupancy rights who will have land of their own on which to practice what they learn at school. The experiment will be watched with interest.

THE CULTIVATION OF SISAL HEMP IN MYSORE.*

By A. CHATTERTON, B. SC.,

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IN this note which is specially written f the people of Mysore, it is hardly nece sary to point out that aloes of various speci in most parts of the State grow luxuriant and are largely planted to form hedge From the leaves of these aloes fibre is e tracted and used locally for the manufactu of ropes and twine. The fibre is not ea to extract as the leaves yield an acrid jui and the separation of the fibre from the pulp is a tedious operation. The industry, if it can be so called, is a purely domestic one carried on merely to supply local needs. There are machines which will easily extract the fibre; but they are costly and require a large amount of power to drive them. They are hopelessly beyond the reach of the cultivators. Further, it is an unfortunate fact that, although aloes are extremely plentiful in Mysore, the species which have been introduced are those which yield but a small percentage of a weak fibre which has a comparatively small commercial value.

There is, however, one species of aloe, the botanical name of which is *Agave rigida var Sisalana*, which is very largely cultivated for fibre in Yucatan, the Bahamas, Florida, what was formerly German East Africa and, to a very limited extent, in some parts of India. This aloe yields a very valuable fibre which is in great demand for the manufacture of binder twine, of which enormous quantities are employed in America every harvest. It was introduced into Mysore by the late Mr. Ricketts in 1892 and since then has been to some extent cultivated

at the Lal-Bagh in Bangalore and from those gardens fairly large numbers of young plants have been supplied to varius parts of India. So far as Mysore is concerned, nothing practical has resulted from the introduction of this plant; but just outside the borders of the State in Coorg, a small plantation of sisal hemp has been worked successfully for the past five years.

In 1914, in Bulletin No. 18 published by the Industries and Commerce Committee of the Mysore Economic Conference, I drew attention to the commercial possibilities of sisal hemp in Mysore; but so far no one has been induced to take up the cultivation of this species of aloe on a commercial scale. After an interval of four and half years, during which I have had opportunities of watching the growth of sisal hemp plants, I am still of opinion that its commercial possibilities in Mysore are very great; but I have realised that nothing is likely to result from advocating the formation of planting companies to take up extensive areas of land with a view to the establishment of large plantations.

Before proceeding further, it will be necessary to give some brief account of the conditions under which sisal hemp will grow. Mr. Cameron, at that time the Curator of the Lal-Bagh, in a paper contributed to the Proceedings of the Agri-Horticultural Society, Madras, in 1903 wrote as follows: "In my opinion, cultivation should be left to private enterprise, though in the case of arid tracts where ragi often fails to reward the raiyat, it may be feasible to substitute a crop of this kind; but that could only be done when a real demand for hemp arises at convenient centres. The advantages of cultivation may be briefly stated as follows:—

(1) Land of gravelly and stony nature is suitbale;

(2) When land is planted up, the cultivation practically ceases for a period of four years or until the matured leaves are ready for cutting;

(3) On suitable land failure of crop has never been heard of;

(4) The profit on an acre of land yielding crop is estimated at from Rs. 60 to Rs. 75 per annum."

"The large succulent growth obtained in rich land is inimical both to the quantity and quality of fibre produced; therefore somewhat poor land of a loose stony nature is always preferred, as in addition to giving better results generally it accommodates a larger number of plants to the acre. Mysore possesses plenty of such land, and if the latter can produce leaves of four feet in length it will do; but there is a reduction in value, as well as difficulty in extracting the fibre, when the leaves are under three feet in length."

From other authorities on the cultivation of sisal hemp, I have gathered information which may be briefly summarised as follows:—Sisal hemp will grow on arid land that seems incapable of any other vegetable life; but the best fibre is grown on a calcareous gravelly soil of medium quality. No fertilizer is ever used. Once the plant has taken root in the ground, no further attention is necessary and the cost of cultivation is negligible. The fibre is, however, difficult to extract by hand but is easily got out by suitable machinery. It takes from five to six years for the plant to grow to the proper maturity to begin cutting leaves. When the plant is growing, all its leaves point upwards; as the plants mature, the leaves begin to open; as they open, they begin to fall towards a horizontal position. As soon as the leaf becomes horizontal, it is perfectly mature and must be promptly cut in order to secure from it the most fibre in the best condition. If properly cared for, a plant continues to yield leaves for about fourteen years in rocky soil and eight years in fertile soil; but if the leaves which become horizontal are not properly cut, then the plant

throws up a stalk instead of leaves and this is the death of the plant. If the cutting of the leaves be neglected, the plant throws up a stalk and when the stalk appears, there is great danger that all the plants in its vicinity will also send up the stalk and die. When the plant reaches the limit of its age, this stalk grows from the centre of the plant and the plant dies. Leaves weigh from 1 to 1½ pounds and 1,000 leaves will yield from 50 to 75 pounds of fibre.

On suitable land, bearing 1,000 plants to the acre, the yield of fibre may be reckoned at not less than one pound per plant per annum or 1,000 pounds per acre. The fibre was worth in London about £30 per ton before the war and is likely to remain so owing to the increased cost of cultivation and difficulties which have arisen in two of the largest areas of production. These are Yucatan in Mexico and German East Africa.

It appears to me that the principal reasons why sisal hemp cultivation has not been taken up in Mysore although the plant grows readily enough and yields a high quality of fibre are as follows:—

(1) Six years must elapse before any return can be expected;

(2) The extraction of the fibre by hand is not possible as a commercial proposition;

(3) The extraction of the fibre by machinery necessitates operation on a large scale and the investment of a large capital on machinery and plant;

(4) There is no local market for the fibre and small parcels do not command a fair price when exported.

Objections of a similar nature and of equal or greater intensity retarded the development of the cultivation of both tea and coffee and the establishment of the tea industry in India is largely due to efforts on the part of the Government of India at the outset. These industries are still mainl in the hands of European planters, thoug there is now, both in Assam in connectio with the tea industry and in the South o India in connection with coffee, a marke tendency towards the development of Indian owned plantations.

I have already referred to the plantatio which has been started in Coorg and i course of time other sisal hemp estates ma be opened out. There are, however, ex cellent reasons why the matter should no be left to chance. Moreover, it is desirabl that the cultivation of sisal hemp should b so developed that the ordinary cultivators o the country should, as far as possible participate in the benefits to be derive from it.

The Mysore Durbar obtains a not in considerable percentage of its revenue fron mineral royalties and from the sale o electric energy which is still mainly use on the Gold Fields. Sooner or later, thi source of revenue will be extinguished wit the exhaustion of the Mines and it will b a wise policy, while there is yet time, to create new sources of revenue to take it place. The electric energy may be used fo other purposes, provided industries ar created which will employ the power Satisfactory progress in this direction ha already been made and there seems ever prospect that, as electric energy become available, a market for it will be found in the growing industries of the State but the gold royalties will gradually decreas and ultimately disappear and it will b sound policy to look well ahead and endea vour to create new sources of revenue In the last few years, the public attitude i respect to the intervention of the State i industrial matters has completely change and there is no reason why the Mysore Dur bar should not take active measures to create new industries if it is in a positio to do so.

It appears to me then that an excellent opportunity to do something in this direction is presented by the failure of private enterprise to take advantage of the natural facilities which exist for the cultivation of the sisal hemp plant. About one-half the area of the Mysore State is uncultivated and there are obviously tens of thousands of acres of waste land which could be well utilised for the cultivation of a plant which grows best on soils which are perhaps favourably described as being on the margin of cultivation.

If the raiyat were in full possession of the information contained in this note and further if he could be induced to accept it as approximately true, there is scarcely any doubt that, provided he was not asked to find capital which he does not possess, he would readily take to the cultivation of sisal hemp. The problem then to be solved is to convince the raiyat that it is worth his while to grow sisal hemp and this can only be done by removing the difficulties which have hitherto prevented the development of the cultivation. This can be done through the agency of the Economic Conference, the District Committees and the various associations which have been established to develop the material resources of the State. Village Committees have been formed in thousands and it is possible that village communal plantations could be started which would ultimately provide these local bodies with a revenue which could be usefully employed on the various schemes of village improvements which are under contemplation.

Government can assign land for the cultivation of sisal hemp free of kist for a period of say seven years, a sufficient time to enable the plants to be brought to maturity. It can supply the plants, charging only the actual cost, and deferring the payment till the raiyat begins to derive an income from them. It can also establish nurseries and model plantations in selected centres to demonstrate its faith in the future of sisal hemp in the Mysore State, and to afford ready maens whereby the raiyats can obtain young plants and instructions how to cultivate them; but it is necessary that Government should go a great deal further than this as individual raiyat will be unable to extract the fibre from his plants and, even if he did extract it by hand, he would be unable to obtain a fair market for it. Government must therefore be prepared to guarantee to take over the crop of leaves when they are mature and to provide the necessary machinery for extracting the fibre, also to undertake the marketting of the crop.

It is difficult to frame an accurate estimate of the returns to be obtained from the cultivation of sisal hemp, as I am not in a position to state what price the hemp will fetch five or six years hence and I can only make an assumption on this point. The price, in London, immediately before the war was from £28 to £30 a ton and it is almost certain that it will be considerably higher than this after the war. I think it will therefore be fair to assume that sisal hemp will realise three annas per pound or Rs. 420 per ton and as each plant will yield a pound of fibre and at 1,000 plants to the acre, the gross return will be Rs. 187-8-0 per acre. In 1914, Messrs. Kirwan and Elsee stated that, as a result of their experience, the cost of extracting and marketting the fibre was about Rs. 175 per ton. It is likely that this figure will be exceeded in the future as freights will certainly be higher but the cost of working under Indian management should be lower. Allowing, however, a wide margin for contingencies, we may put the charges under this head at Rs. 280 a ton which will leave the raiyat Rs. 140, equivalent to one anna per plant per annum. With a thousand plants to the acre, the raiyat may expect to obtain a net return of Rs. 62-8-0 per acre. It may easily be considerably more than this but it is hardly likely to be less.

It will serve no useful purpose to go into minute details as accurate data for them are

not available. I think it is sufficient to show that sisal hemp cultivation offers prospects of an extremely good return. My estimate of the prospects is strongly supported by certain general considerations about which there is no doubt whatever and which do not depend upon assumptions regarding current market prices. We know that the sisal hemp plants will grow in Mysore in a perfectly satisfactory manner and will yield a high class of fibre comparable with the best fibre produced in other parts of the world. Further, we know that the conditions in Mysore are such that the cost of bringing the plants to maturity, of cutting the leaves, of extracting the fibre and of putting it on the market will be less than in any of the tracts where sisal hemp is now cultivated. It is therefore quite certain that, if sisal hemp is grown in Mysore on a sufficiently large scale, it will be able to compete with plantations in other parts of the world.

I have no accurate figures regarding the total production of sisal hemp; but it is estimated that the world's consumption of binder twine alone is 250,000 tons per annum. India exports large quantities of hemp, chiefly sann hemp, a fibre inferior to sisal hemp and commanding a much smaller price, and the following figures extracted from the Sea-borne Trade Returns are of interest as showing how important the Indian fibre crops are :—

Year	Exports in tons	Value in rupees	Value per ton at port of shipment
		Rs.	Rs.
1914-15 ...	33,511	99,43,334	298
1915-16 ...	30,413	1,02,53,742	337
1916-17 ...	35,059	1,52,26,058	338
1917-18 ...	16,886	88,29,696	528

The great reduction in exports in 1917-18 is due to the restrictions on shipping as the very high price realised clearly indicates a strong demand.

It is now necessary to indicate briefly the commitments of Government if these proposals are accepted for the encouragement of the cultivation of sisal hemp. For a period of at least ten years, Government will have to establish nurseries in many parts of the State and to maintain them for demonstration and for instructional purposes. An average of a lakh of rupees a year will not be too much to spend on this account. For the first six years, there will be no return; but after the expiry of this period, the raiyats should commence the repayment of the cost of the plants supplied to them. At the end of four years, it will be necessary to purchase machines for extracting fibre and to set up central depôts for the receipt of leaves, where the fibre will be extracted. We may take it that each central depôt will cost at least Rs. 60,000 and that will be capable of dealing with 500 tons of clean fibre per annum, equivalent to the produce of 1,120 acres. This is the most economic unit that can be employed for extracting fibre; but in places where so large an area is not brought under cultivation, smaller machines capable of dealing with only 200 or 300 acres can be employed at the outset. There can scarcely be any doubt that once this cultivation is started on the lines herein set forth and once the profits are realised, it will spread very rapidly and will probably extend to hundreds of thousands of acres. Roughly, each thousand acres will require an outlay of Rs. 60,000 in machinery and plant and that each thousand acres will yield nearly two lakhs of rupees worth of fibre. Obviously, the more extended the scale of cultivation, the greater will be the return realised.

It would be comparatively easy to produce definite figures based on certain assumptions; but this I prefer not to do and to leave the result stated in a somewhat vague form. I have no doubt that if this

matter is taken up in a thoroughly efficient manner and carried on strenuously, it will result in at least a lakh of acres being brought under cultivation within a reasonable period and from this area, gross returns of from Rs. 1,75,00,000, to Rs. 2,00,00,000, will be obtained. Such a result is well worth investing a lakh of rupees per annum for a certain number of years. The capital expenditure necessary after the cultivation is established, requires no justification. There is not the least doubt that it will yield a very handsome return. To deal with a hundred thousand acres will require about 5,000 Horse Power and in many parts of the State this power will be available in the form of electric energy and where such is the case the working expenses will be greatly reduced.

So far, I have only considered the question from the point of view of producing a crop which can be exported ; but there is no reason whatever why the raw material should not be worked up into finished goods in this country. With electric power available, factories for the manufacture of ropes and twine can be established and worked as cheaply as anywhere in the world. It is not necessary now to consider this in detail. With large supplies of raw material at hand, there is no doubt that private enterprise will, in due course, be forthcoming.

The six-room dwelling of a Colorado farmer is a striking illustration of odd building construction with cement. The house is 48 by 18 feet in size, and has the outside appearance of an ordinary concrete building, but consists of bales of straw coated with cement. After laying like stone blocks, the bales were covered with cement mortar, a sprinkling of pebbles being added in the outside finishing coat. Windows were fitted into the thick walls, a tile roof was provided, and the walls and ceiling inside were plastered. Not including labour, the cost was about £54, says *Pobular Sience Liftings.*

OPENINGS FOR YOUNG MEN.

By S. C. Satyawadi, M.A.,

Asst. Collector of Custom Calcutta.

I confine my remarks to Young India, *i.e.*, people who are taken as the standard for judging a nation's stage of development, who serve as the basis for progressive measures and form the backbone of national vitality. At present, to be more concrete, the paper therefore deals with the youths of the middle classes, some from the lower and none from the higher.

Before entering into the present situation, a historical review though brief would greatly assist the due handling of the subject. These young men till the advent of the Western nations generally carried on agricultural operations with or without an establishment of domestic servants in the small village republics. Also they could win distinction in the Army and the Navy within the restrictions imposed by their circumstances. Lastly, along with high educational careers, they had industrial and commercial enterprises to give a scope to the human tendency to develop or at least to live and live well.

With the advent of powers materially superior in strength and obviously determined to carry out an industrial policy of its own backed by military force and wise use of better methods, most of these openings went out of doors. Process was openly destructive in a very few cases, *e.g.*, Muslin of Bengal but generally peaceful absorption. Foreign piecegoods replaced locally woven cloth. Army and Navy were closed for Indians. Ultimately, only two lines remained for Indians, where they could with any pretension at self-respect earn a livelihood—viz : agriculture and state rather Government service. Also other circumstances including a defective system of education though nobly

inspired at start but imparted through an ill-inspired machinery accentuated the increasing narrowness of careers open to talent.

The natural result was inevitable. Partly with an inert agricultural community and partly with a superfluity of state servants and appendages, the country began to move rapidly down the incline to poverty. Personally when I look back at this period, I am reminded of the march of Aurangzeb in the Deccan. The great army of Government servants afforded the only place for getting an honourable living. But the huge army is not the only evil as in a way it ensures security. But the attendance of camp-followers like lawyers, amins and process-servers, "twenty times as numerous as the effective strength" became the pests of society. And as Lane-Poole says, "so vast a host was like a plague of locusts" to the sole productive industry of agriculture and was enough to suck up the essence from the "Laboratory of Life" the earth.

Congestion in agriculture and keen competition in State service resulted in a deadlock. Au opening in the shape of State disservice crept up giving some irresponsible socialistic ideas and disbursing among others more extreme nihilistic ideas. Remedies mild and drastic have been tried with sufficient success. But the common folk in his shrewd commou sense cries for a remedy that goes to strike at the root of the malady and that cry is for fresh openings.

It is for facts to show whether he is justified in raising the note often unpleasant to many. You will find quite a large school of thought that would insist on the perpetuation of this misery under the ill-disguised hypocrisy of sympathy. This school shuts its eyes to the national subservience to others in matters of daily needs, proves its theories by showing that men work for University certificates while they can better employ themselves in other ways, roar with wild glee when they find bright youths launching themselves on the sea of life in their paper canoes and yet close with the well wishers remark that such men should always be "the hewers of wood and drawers of water."

But when the river gets a flood, these dams only raise the level to increase he force and everyone including the Government become alive to the needs of a nation And the present position is that there are promises for fresh openings in every direction. But they are promises. To be in touch with the present the fresh openings have not borne to the people quite a similar rosy view. Agriculture is in its struggles with the userers, and the Army and the Navy afford consolation to a microscopic part of the nation. There is more scope in the participation in the administration of the country and also some openings have been made for Typists, Accountants, Babus. But tested on the stone of economic advantage these carry far enough politically but not materially These openings are necessary for material welfare but must lead to what is called increase of productive labour. And the only way to do it is to revive the old discovery by Famine Commissioners of 1889—Diversity of Industries.

I am not going to discuss the superiority or inferiority of industries to pure agriculture unsoiled by the smoke of the factory chimneys as it is beyond my subject. Industries are here at a very low ebb and without wasting time on the innumerable causes for the absence of openings therein, I shall discuss the merits of the chief ones. Want of raw material, manual labour and capital I reject at the start. I lay stress on quite other things—lack of technical knowledge, lack of organizers, lack of opportunity and lack of initiative.

To take these in order—

High technical knowledge may come when the beneficent boons recommended by the Industries Commission after long deliberations of three years bear fruit. But in the present also, the accumulated stock of knowledge in India is quite enough for modest

enterprises; small treatises, ordinary technical details can be had; coupled with the training in the school of life, knowledge is ample. A carpenter's work does not need much knowledge, and improved work therein can be acquired even now. In sericulture, glass-blowing, bee-hive industry, minor forest industries, organized dying, toy-making, artistic industries and ordinary crafts, no high technical training is essential and for all of them more than enough material is easily available. As regards industries requiring more technical knowledge Indians do stand at a certain amount of disadvantage, but it is more often due to some ill-judgment of the organizer rather than the absence of technical knowledge. I have seen one case of sugar enterprise in which promoters and directors started a factory without seeing whether they would be able to get cane juice. It was sold out and the European purchaser arranged to refine sugar not from juice but molasses which he could get from other places and could even import. This whole failure was due to the fact that there was no businessman in the directorate, which consisted mostly of lawyers and public men. Hence even though very highly competitive industries are yet out of question, there are enough for which with perseverance and sound common-sense a man can push up. To name a few, fertilisers, organization of cottage industries, transport (land and water), small industrial banks, distributing shops, etc., afford quite enough openings.

As for organizers, master-workmen, foremen, *i.e.*, men to fill the commissioned and non-commissioned ranks of officers we have not to seek them far. If men can toil and toil for the B. A. degree in spite of failures, can we not divert them to industries? If a man able in all ways finds service too narrow to give vent to his capacity, will he not be overjoyed to get a new opening? It is just at present that industry opens a line for even average men. Its condition at present is what the state of Government service was a few decades back. There is no recruitment to higher grades and the least sign of something above the low industrial average is sure to get its recognition and push up the man. After some years industries will bring about as keen a competition as Government service and if time can be held by the forelock, it should be done at present. Organizers and middle-class men are more than enough for these lines in number and worth.

As regards opportunity I have said something above. Government attitude of indifference and often of impatience towards industrial development affords the best opportunity and should be availed of to show the Government what is actually needed. The obstructions put forward by petty authorities are sure to disappear when capable men fill the industrial ranks and not conservative Banias with a hereditary knock to say "*Jo huzur*." The unequal competition that is brought about by foreign politics and the injustice that is often done thereon will disappear with the rise of public opinion, strength of the people and chiefly with the ability of the men who can assert their cause in the teeth of unreasonable opposition. These are questions for higher grades. For ordinary and our purposes, many of these disappear if there is enough skill in the operator.

But still industries have not succeeded well because the chief cause has been lack of initiative. 'Who will bell the cat'? is the problem. There are no bright lights to guide. Your own lodestar must help you. Those already in the field, the Europeans and Anglo-Indians regard it as a profanation to tread on their ground. Instead of lighting beaconfires, they will raise whirlpools for you. And you succumb because you sail for the deep sea when you have not well reconnoitred your own shores well seen and studied the creeks and corners to know where you have shoals to strand your ship and where you have havens to shelter in storms. Secondly, the Indian disadvantage has been that the intelligent men are mostly diverted to Government service under the temptation

of fixed incomes. And still in spite of all stupendous gains the hitch is—who will cross the threshold to glory. Uncommon glory too is as much an object of common dread as uncommon misery and shame.

But this state of affairs is only transitory. An era of industrial development is sure to come and that too shortly. I shall not quote proofs to show that the present times are the crucial moments in the industrial history of India. The choice is between industrial supremacy and economic slavery.

There have been under the contemplation of the Government of India several schemes to better utilise India's illimitable resources. The Industries Commission has foreshadowed what is to come as far as the Government is concerned. But who gets the benefit depends more on the issues of these times. The hopes raised by the recent change of vision by the Government would be only chimerical unless men come forward for industries in the right spirit. I have shown that they can come with much gain to themselves. I may now tell you that the gain will be greater still to the country. Because the boon of the Government if not taken by Indians would benefit Mr. Jones and Mr. Smith of European mercantile firms to further fleece out India. Or worse still, as Sir William Clark pointed out, "the manufacturer who now competes with you from a distance would transfer his activities to India and compete with you within your boundaries." The danger may not be well appreciated. It is there and if it is the result of Indian Industrial Renaissance, the nation is doomed and posterity will only curse the day when the present generation in its idle weakness let the time pass.

And there is the other side to the shield. If this great danger is arrested, there is bright sunshine behind. It is no use saying that the Government did this or that. Assert your claims when you have reason to. Win them in a spirit of reasonable toleration but win them as their loss means perhaps much greater danger to your later activities. There is no cause in murmuring against misfortunes and hard work. All in every sphere of life have them. And then opens out a vista of happiness.

Necessarily, this need of youths in the industries imposes some responsibility on those who cannot go in industries. It is for them to see that right men go in the industries with right knowledge and with opportunities. So the duty divides into four heads:

(i) Selection of right men,
(ii) Dissemination of proper information and knowledge,
(iii) Establishment of opportunities,

and finally (iv) Watching such careers.

For all organized bodies having within the competence of their rules to go a little beyond cutting the intellectual teeth on discussions, I would make bold to suggest that they should, if they agree with me, form a scheme to carry on the functions above-mentioned without, of course, disturbing their other duties. I would, however, point out that unless the scheme is decidedly useful, mere idea of patriotism should not be the only basis.

As a preliminary step, you have to open an Information Bureau where you will collect all possible information about all Indian industries and also sources where such information can be had. Then find out possibilities of success and in some cases watch men who have already entered in Industrial enterprises. You can then get right men and help them financially if need arises. The principle, if accepted, can be formulated into a regular scheme and if properly managed should not entail much particular labour on any person of the Association.

But before I close, I think I should point out two safeguards that should always guide men in the promulgation of the scheme. Firstly, no one who can get a satisfactory and decent living elsewhere should be diverted to industries. Secondly, those who take the industrial line should devote at least two years as students in that branch without any idea of remuneration. It is here that many get their quietus. A man may fail ten times in his Intermediate but ever if the Spirit of Kindness desires him to go to industries, his evil fate directs him to secure at least what he would get after becoming a graduate.

I wish I had dealt with the portion about opportunities more in detail, but my short experience withholds me and inability to advance it precludes me from ever going much beyond repeating the usual War Cry of the Industrial Army—

WORK AND WAIT.

THE WAR AND INDIAN TRADE.*

By G. Findlay Shirras, M.A., F.E.S., F.S.S.,

Director of Statistics, India.

IT is a great pleasure to renew one's acquaintance with Dacca. It is, as you are aware, my official birthplace as I came to India as Professor of Economics in your College. I have never been able to shake off the wonderful and inexplicable but absolutely irresistible fascination of Dacca. I miss many old friends here to-day. Some have passed peacefully into the Great Beyond, others have retired under the Atropos of our age rules to the *otium cum dignitate* of a pleasant existence in their native districts, while others are still in the saddle helping to guide the fortunes of this province. Nearly ten years ago I lectured to a Dacca audience on "Some Aspects of Indian Commerce and Industry." To-day I find myself in a similar position, having been asked to address you on the effect of the war on India's trade, and I shall try to sketch, in the briefest outline, the main effects of the war on our trade and the lessons which the shears of war have laid bare to us.

In the first place the persistent demands on the part of our Allies for our products stimulated the export of commodities of vital or national importance, and at the same time altered the direction of our trade with countries abroad. Secondly this demand reacted on Indian industry. Necessity became the mother of invention, and the war with all its attendant evils proved a great impetus to industrial development.

Despite the phenomenal shortage of ocean freight and the restrictions on the outflow of our goods, especially to neutrals, the value of the overseas trade in merchandise was last year† nearly Rs. 393 crores as against Rs. 370 crores, the pre-war average. Imports of merchandise, as compared with the five pre-war years, increased by 3 per cent, exports by 6 per cent, and re-exports, owing to the scarcity of shipping and the necessity on making India for the moment a distributing centre, showed an increase of no less than 97 per cent. A part, in some cases a very large part, of the increase in the value of the imports and exports was due to a rise in prices. Imports last year† for example, were valued at Rs. 150 crores or Rs. 79 lakhs more than in 1916-17, but when the prices of the latter year are applied, the value is reduced to Rs. 122 crores, thus showing an increase in the import trade on account of higher prices of 23 per cent. The actual volume of the trade decreased by 18 per cent so that Indian importers had to pay 23 per cent more to get 18 per cent less. The actual declared value of exports last year† was Rs. 233 crores, while the value calculated at the prices of the previous year was Rs. 216 crores, or in other words, there was a gain of 8 per cent on account of higher prices. The volume of exports, however, was as compared with the preceding year, 9 per cent less. Thanks to the good monsoon of 1917, our harvests, the mainstay of the country, were plentiful, and it was, therefore, possible to export considerable quantities of munitions of war to the United Kingdom and the Allies. When we remember that in spite of immense difficulties in freight, India sent goods to the value of Rs. 127 crores to England and to other parts of the British Empire, and Rs. 90 crores to the Allies, the efforts of commerce and industry can be termed nothing less than an epic of endeavour. The exports of food grains, especially wheat, barley, and gram, jute manufactures, tea, tanned hides, chromite, piglead, vegetable oils, rubber, cotton manufactures, and cigarettes were greater in quantity than in the pre-war

* An Address at the Social Service Exhibition, Dacca, March 6th, 191^

† 1917-18.

period. Imports of sulphuric acid, a supremely important commodity to the industrialist, dyes, metals, motor cars, kerosene oil, paper, wood pulp, provisions, salt, railway materials, cotton and woolen goods were, owing to the war, much below our pre-war requirements.

It will now be clear that with this large demand for Indian products and the difficulty in obtaining imports either in the form of merchandise or treasure in payment for these, the gap between exports and imports, the balance of trade, was bound to widen. The favourable balance of trade grew to unprecedented proportions. I do not propose to penetrate the thorny labyrinth of facts relative to India's balance of trade but merely in passing to make a few remarks on a plain fact, sometimes very dull and very little understood. This permanent excess of exports over imports, this so-called favourable balance of trade, exists simply because there are other things, such as interest due to India's creditors, pension and other Home charges to be paid for, besides the imported goods. Before the war these transactions were done with ease and rapidity and with the minimum movement of specie. Gold in international trade moves very little, and imports of goods are paid for by exports. The transactions are ordinarily settled through the great clearing house of the world—London. Since the war the balance of our trade between our customers and ourselves has been settled, to an extent that was not possible before the war, direct. In war time the balance between each pair of countries, *e.g.*, between India and Japan, and India and the United States, has been of real moment. Japan and America have, indeed, sent us considerable supplies and gold. London is no longer a free market for gold as the belligerents are conserving to their utmost their supplies of the yellow metal. But these are temporary and abnormal conditions, war and not peace problems, and can be ignored in discussions of permanent positions. Without going into the hazy and hazardous, unrecorded or "invisible" imports, or the oft-told tale of the accuracy or inaccuracy of trade statistics, I need only say that the excess of exports over imports was £61,000,000, and to liquidate this large favourable balance of trade, treasure and funds were imported to the extent of nearly £50,000,000.

	1909-10 to 1913-14 Pre-war average	1916-17	1917-18
	£	£	£
Net exports (excess of exports over imports ...	52,179,000	63,677,000	61,420,000
Net imports of treasure and funds ...	52,464,000	33,282,000	49,830,000
(*a*) Council drafts, etc. ...	28,416,000	31,925,000	34,553,000
(*b*) Treasure	24,048,000	1,357,000	15,277,000
Balance of Trade in favour of India ...	...	30,395,000	11,590,000
Balance of Trade against India ..	285,000	..	...

The balance of trade, *as adjusted* above, was in the pre-war years against India, notwithstanding that there was a large excess of exports, over imports, but in the last two years there was a large balance, after adjustment of the available statistics, in favour of India. India has in other words been assuming for the moment the rôle of a creditor rather than that of a debtor country.

The deplorable waste of resources involved in the absorption of the precious metals has been strikingly brought out during the war. In the five years ending March 1918, gold was absorbed to the extent of Rs. 81 crores, or more than one-half of the world's production in an ordinary year. The net imports of silver were, in the same period,

early twice the world's annual production. ince April 1915, 1,200 millions of silver upees, as Sir James Meston pointed out a ew days ago in presenting the Financial tatement in the Imperial Legislative Couucil, had been drawn from our mints at alcutta and Bombay which have been working night and day to cope with this nsatiable demand. In December, no less han Rs. 834 lakhs were turned out, a world's ecord. From April 1918, 200 million unces of American silver have been and are oming to India. There is no justification or this continuing waste and unless it is hecked and the hoarded coins restored to irculatiou, Government may be forced to econsider the whole basis of India's curreny and exchange policy. But that is not all. f this country had not this ingrained fondess for the precious metals, and if in place f taking silver from Ameria had preferred redits at 5 per cent per annum we should ave received in interest alone—Rs. 300 akhs (£2 millions)—sufficient to pay the ost of Public Instruction in Bengal for nore than twelve months. We should be nuch better off if we imported goods in preerrence to the precious metals. If the netals are hoarded in the form of jewellery, tc., they are put to non-productive uses; if hey are absorbed, then prices tend to rise nd this brings in its train a host of difficulies. I shall have more to say on this ppalling dissipation of resources when I ome to what may be called the effectiveess of Indian production.

With these remarks I now plunge *in nedias res*. The monsoon of 1917, unlike hat of 1918, was an exceptionally good one, vith the result that food grains in the year 917-18, especially on account of favourble prices abroad, were profitably exported. The exports of food grains were over 4½ milion tons valued at Rs. 54 crores. The quantiy exported was only 100,000 tons above the re-war quinquennial average, but the value vas greater by nearly Rs. 8 crores. We were able to export nearly 2,000,000 tons of rice; and arrangements were made for the Royal Commission on Wheat Supplies to buy the Allies' requirements of rice estimated at 100,000 tons monthly from Burma, and the United Kingdom for the first time took the largest share of the trade. Burma which provides more than three quarters of the rice exported from India has diverted to India, since the failure of the monsoon in 1918, her surplus exports. Owing to the wheat harvest of 1917 being the best on record, the exports of 1917-18 were nearly double those of the previous year and 11 per cent above the pre-war average. The wheat bought for export on behalf of the Royal Commission during 1917-18 amounted to nearly 1,580,000 tons. The exports of gram, pulse, maize, barley, jawar and bajra were 68 per cent above the pre-war average. All these exports of food grains took place in the year ending 31st March 1918, and, therefore, before the unsatisfactory monsoon of 1918. As everyone in this province knows, there was prohibition on export of raw jute to all destinations except under license and this produced a fall of 64 per cent below the pre-war quinquennial average. The exports were, in fact, the lowest on record since 1877-78. The jute mill industry was more fortunate than the growers. The exports of jute manufactures were valued at Rs. 43 crores as compared with Rs. 20 crores, the pre-war average. The net profits of Jute Mill Companies have amounted during the last three-and-a-half years to nearly Rs. 30 crores. During the three years ending 1917-18, 1,073 million bags were shipped on Government account and 375 million yards of cloth. There were last year* 76 mills at work with 41,000 looms and 834,000 spindles which gave employment to 266,000 hands. In the tanning industry the war has been a blessing in disguise. The total shipments of tanned hides were double the pre-war average and

* 1917-18.

almost the entire quantity was shipped to the United Kingdom. At least three-fifths of the upper leather used in the United Kingdom in the manufacture of boots for the British and Allied armies is supplied from Indian tanned hides and the Controller of Hides informs me that most of this tanning was done in Madras and Bombay. In addition to this about 40,000 hides were supplied monthly from the Bombay tanneries to Cawnpore for army requirements in India. The best class of hides from Northern India which were formerly exported to Germany and Austria are now being sent to the Southern India tanneries. Shellac, mica, wolfram, manganese, etc., have also been exported in large quantities to the Allies. Tea was exported in 1917-18 to the extent of 359,000,000 lbs, 35 per cent above our pre-war average exports and easily a record export. 90 per cent of these exports was from Bengal and in this connexion the direct shipments to Canada and to the United States of America are an interesting feature of the tea trade in war time. The Indian cotton industry has increased its production by 46 per cent as compared with the pre-war period. The exports of Indian made piece-goods in the same interval have grown from 90 million yards before the war to 189 million yards last year.

India's chief import is cotton piece-goods. Owing to the war the quantity imported decreased from the pre-war imports of 2,600 million yards to 1,500 million yards, a decrease of no less than 42 per cent. This explains the large rise in the prices of dhutis and saris which is a matter of vital concern to all of us. The value of the goods, notwithstanding a decrease of 42 per cent in quantity was 9 per cent above the pre-war average. The share of the United Kingdom in grey goods has decreased since the outbreak of war from an average of nearly 99 per cent to 87 per cent, in coloured goods from 93·5 per cent to 91·8 per cent, while her share in imported white goods has increased from 98 per cent to 98·8 per cent. In the same period Indian mills showed an increase in the production of the finer varieties, particularly coloured goods, and also increased their production of yarn. The interesting derease, since the outbreak of war, in the imports of iron and steel, sugar, railway plant, and kerosene oil need only be mentioned. The value of railway plant and rollingstock last year* was only one-ninth of the pre-war average. The imports of kerosene oil were only 31,000,000 gallans as against a normal pre-war figure of 67,000,000 gallons. Similar instances of the curtailment of imports of primary necessity could be multiplied.

The direction of trade has changed as a result of the rapid march of events in the fifty-one months of war. We are now dealing with the British Empire to a greater extent than we did before the war, the share of the British Empire being 57 per cent as against 53 per cent in the pre-war period. The profitable markets lost by Germany and Austria have been taken temporarily mainly by Japan and the United States. Imports from Japan last year* had increased by 400 per cent above the pre-war quinquennial average, wnile the exports to Japan increased by 103 per cent. The imports of cotton piecegoods from Japan, for example, have increased in a phenomenal degree :—

—	Grey (unbleached)	White (bleached)	Coloured, printed or dyed
	Yards	Yards	Yards
Pre-war average—(1909-10 to 1913-14) ...	2,559,000	48,000	521,000
1917-18 ...	73,278,000	2,602,000	18,676,000

A predecessor of mine, the late Mr. O'Conor, Director-General of Statistics,

* 1917-18.

rote in the Review of Trade for 1888-89 Imports from Japan are quite trifling, eraging less than three lakhs annually in e last five years, and there are no indica- ons of an increase unless the imports of pper should be resumed." Imports last ar from Japan amounted to over Rs. 18 ores and exports to that country to Rs. 34 ores—the total trade exceeded that with her countries except the trade with the nited Kingdom. The value of the trade ith the United States has grown to 200 per nt what it was in the pre-war period being cond only to Japan.

Now with regard to Indian industries. e large changes in our foreign trade acted, as was to be expected, on Indian dustry. The share of manufactured goods the export trade of the year increased to per cent from nearly 24 per cent, the e-war average. We have already passed review the unparalleled prosperity of our te and Cotton Mills. The restriction on anufacture abroad and the consequent mand for commodities were an impetus to dustrial development. The use of indige- us tanned stuffs has been extended by the nning Research Factory and by the ap- intment of an expert tanner by Govern- ent. The Tata Iron and Steel Works, signed and erected by Americans, have, ice the war, been a national asset. These n out 300 tons of rolled steel per diem d it is proposed to increase this to 1,500 ns, which is about one-third of the require- ents of the country. At Jamsedpur (Sak- i) about 11,000 workmen are employed by e Company and in addition there are 2,000 rkmen under contractors, making a labour ce of 13,000 men whose wages amount to . 2 lakhs a month. The Sandal-wood Oil ctory in Mysore is another example of industry brought into existence since the r. Sandal-wood formerly found its way to rmany where the oil was extracted from The Oil Factory at Bangalore which mmenced work in May 1916, now produces 5,000 pounds of oil a month, and the net profits have already amounted to over three times the original outlay. The large output of the mines near Namtu belonging to the Burma Mines Company, Limited, is another instance and indeed this promises to be a second Broken Hill, the great centre of sil- ver production in New South Wales. The production of refined silver has risen from *nil* to 1,525,844 ounces between 1915 and 1917 and the production of refined lead from 6,947 tons to 16,957 tons. These facts speak for themselves. No one who studies the progress of Indian industry not merely during the last ten years but since the outbreak of war as published in the Com- mercial Statistics of the Government of India (Statistics of British India. Vol. I— Commercial) can fail to be struck by the industrial progress in this country. One has only to scan the tables in that volume of our great organized industries of jute, cotton, tea, and coal, not to mention other power-using industries, such as the iron and steel industry, woollen mills, oil and paper mills, tanneries, and petroleum refineries in order to see the progress that has been made.

During the stress and strain of war the importance of a definite Government policy for the encouragement of industries has been as clear as sunlight, and steps have been taken in spite of not inconsiderable difficul- ties. Looking back over the war period we see that the Government of India have as- sisted industrial development in several ways: (1) by taking all possible steps to guard against the unnecessary import of articles which are or can be produced in India. This has led to new openings for in- dustries in India in great numbers; (2) although technical experts could not be readi- ly obtained on account of the war, expert knowledge has been so far as practicable orga- nized for the first time and made available to industrialists seeking to begin new con- cerns; (3) new industries have been assisted

and encouraged, as the Hon'ble Member for Commerce and Industry pointed out in the Imperial Legislative Council in September 1918—"Caustic soda, magnesium chloride, thymol, sandal-wood oil, copperas, zinc chloride, and refined nitre are chemicals which have now been made in India for the first time on a commercial scale. Ferro-manganese is being produced in large quantities and has even been exported. The manufacture of micanite has been taken in hand by a private firm and by the East Indian Railway. The production of silicate bricks for lining furnaces has been developed so far that it is hoped that India will soon be independent of foreign imports. Great progress has been made in the output of accessories for the textile and tea industries;" (4) industries already established have greatly increased their output since the war. I have already referred to the effect of the war on the jute, cotton, and steel industries. In this connexion it is often not realised how far Indian industries have supplied the Army Department with goods that, before the war, were chiefly imported. In 1918, at least 30,000,000 yards of khaki drill and of grey and bleached cloth were purchased in India as against 610,000 yards before the war. Webbing and tapes, the product mainly of small artisans, have been purchased to the extent of 49,000,000 yards. The purchases of Indian made flannel were 850,000 yards against 32,000 yards before the war and of grey-coat-cloth 650,000 yards against 16,000 yards. The output of boots last year, two million pairs, was more than twenty times the pre-war figure.

Let us now very briefly—for I am conscious of having wearied you—try to outline broadly and sympathetically the new standpoints from which the industrial field has to be regarded. How are we to promote Indian commerce and industry? How are we to promote both our foreign and internal trade in the period of reconstruction? The answer has been authoritatively and completely given in that monumental report—the Report of the Indian Industrial Commission. There is, however, one topic in this Report that has not received anything like the importance which it deserves. I refer to the effectiveness of industry—the production of goods which are cheap in comparison with their quality. To secure effectiveness land, labour, capital, and organization must be put into our products with the maximum of efficiency. This effectiveness is at the basis of all prosperous trade. Professor Taussig, Chairman of the United States Tariff Commission, in an address to the Chamber of Commerce of the United States, at Chicago, in April last year, pointed out that "the *effectiveness* of labour and capital means something different from that which is usually implied by the word 'efficiency.' 'Efficiency,' as that term is often used, refers to special and individual skill, intelligence, and activity on the part of the individual workman, to his mental endowment or personal aptitudes or muscular strength. Now, it is true that the high standard of living and the greater spirit of activity in this country do bring it about that our workmen are, man for man, efficient than those of foreign countries. But it is not solely, or even primarily, efficiency in this limited sense that I have in mind when speaking of the effectiveness of our labour and capital. I refer to the cumulative influence of all the factors which combine to bring about the final production and final putting on the market of the exported commodities. The factors are many and diverse; not only the individual efficiency of the men, but ingenuity on the part of inventors and engineers in perfecting machinery, skill in the designing and organization of plants, brains and enterprise in management, intelligence in the distribution and sale of the goods. No small part is played by transportation and especially by inland transportation. Whatever may be charged against our railways, they have succeeded in cheapening transportation immensely

especially in long-distance hauls, and they have been a powerful factor in increasing the effectiveness of the total labour of the industrial processes. And, throughout, the thing which probably tells most of all in assuring a combined effectiveness of our labour and capital is industrial leadership. It is this which has made the modern economic world; it is this which justifies business and the profits of business. I need not say that this means also leadership in service. Successful leadership implies as its end and purpose, not money making, but service in promoting the effectiveness of industry."

Let me illustrate this with reference to the jute industry. The prosperity of our jute cultivation and of all those who depend on jute for their livelihood turns on the production of a large quantity of jute, raw and manufactured, and on its exchanging these products for other products. To produce these commodities cheaply means that quality as well as quantity must be preserved. An article of good quality may be high in price, but its quality must be so good as to make this high price worth while. I have here samples of sand bags captured from Turkish and German trenches. Side by side there are Bengal sand bags. You will note that the former are made of paper yarn and the bags are excellent substitutes for the Bengal product. Now, if the gunny bag is to compete successfully with these textilite and textilose materials, effectiveness in production is essential. That means a large production of jute, grown at remunerative prices, and still cheap enough to enable the manufacturer to compete in the world's markets. It means efficient labour, and Indian labour is costly, very costly. The outturn of labour is comparatively low and the cost of supervision, as the Chairman of the Bengal Chamber pointed out some days ago, great. It is, however, interesting to note that the Bengal mills are now "getting off" the looms in 13½ hours what was previously obtained in 15 hours by an excellent system of shifts by which the labourer is usuall employed for 8 or 9 hours a day. Intensiv labour worked on an organized system o shifts pays. In no other industry, perhaps in India is organization as a factor of produc tion more carefully studied than in th Bengal Jute Mill industry. It is unfortu nate that the Bengalee labourer cannot hol his own against his confrères from othe provinces. It may be that the profits fro growing jute and rice are sufficient to enabl him to live from harvest to harvest witho adding to his earnings elsewhere. It ma be, too, that he has no desire, not havin tasted the benefits of education and a high standard of living, to rise in the world an to enjoy the fruits of efficient labour. Sti the fact remains that the Bengal Jute Mil find it profitable to use labour from oth provinces. I am indebted to one of the lea ing representatives of the Industry for stati tics which show that in 1902 Bengale formed 28 per cent of the whole labour for in certain mills. They are now reduced 10 per cent, their places being taken l labour from Bihar and Orissa and the Un ted Provinces, and also from Madras. N only is the proportion relatively smaller, b the actual number of Bengalees employed the Jute mills is absolutely less than it w sixteen years ago. I am also convinced fro the most careful evidence which I have co lected that the middle-class Bengalee do not take kindly to industrial enterprise. Ev in the skilled class of labour the Bengal ju mill industry has to depend on import labour.

I have taken the Bengal jute mill indust as an example of the importance of looki to effectiveness of production during o reconstruction period. Rome was r built in a day and we cannot hope secure the ideal in a day. At the same tir it would be ungenerous and unbecoming deny that there has been amongst us spirit of apathy and too strong a pedan respect for mouldy precedent. The th

great requirements of India at the present time are (*a*) more and better education, (*b*) greater banking facilities, and (*c*) more adequate and easy means of transport. I do not propose to refer to (*b*) and (*c*) except to remark that the Industrial Commission has recommended the appointment at the earliest possible date of an expert committee on banking to consider this all-important question. As regards communications I need only say that the Government of India are in the coming year to undertake the biggest railway programme ever yet undertaken. It is proposed to spend no less than £17¾ millions, an imposing figure. The previous record was £12 millions and in the war years, now happily behind us, the programme had fallen to £4 or £5 millions. This is an augury of the coming reconstruction period when India's commerce and industry will, it is hoped, greatly expand. It is with regard to the first of these three problems that I shall refer, as our whole future success in commerce and industry depends on education.

Education is of sovereign importance because it is the key to employment and prosperity, and indeed to all national advance. I confess to being an enthusiast on this, and the more we examine the problem from an industrial and commercial standpoint, the more do we see how true it is that until primary education is more widespread, industrial advancement will have no sure foundations. There will be no raising of the standard of living and no enhancing of the value of the people's labour until primary education is more accessible. Our secondary and our collegiate education with the terrors of the examination hall do anything but divert our young men from literary or legal careers. There is here a grave loss to the community because, as Sir James Meston puts it, "In all these young men, who now hang on to the skirts of chance, there is material for increasing the wealth of the country. They could be used, and are urgently wanted, in trade and industry, in the handling of labour and the preventing of waste. Give them a sound general education, apprentice them in time to business, and they will have an economic value. But get them half-taught, consume their best years in a struggle which leads to nothing, and what is your return but discontent and economic shrinkage"? We shall, by a better and different system of primary education, make the workman able to earn more and to be, in short, a more efficient worker. By secondary education we shall produce workers of ability, able to supervise the ordinary labourer, and by scientific, industrial and technical education in our Universities we shall be able to turn out men capable of undertaking administrative and industrial work. Both administrative and industrial work require apprenticeship and training. Sir Thomas Holland in his Convocation Address to the Madras University last November sketched in firm outlines the importance of reforms in Indian Universities—"If Universities are to retain their value in any civilised and developing country, they must, like business men, adapt their methods to the growing needs of the community. To what extent the Universities, by moulding the form of education, can contribute to the cause of industrial progress will depend on their recognition of the fact that practical appreciation of the physical sciences is of fundamental importance to every modern form of industry. * * * It is impossible to overestimate the value of scientific research in dealing with the raw products of India. Until we know more about their nature it is impossible to turn them to industrial account. There is an enormous mass of material in India awaiting investigation and unlimited field for post-graduate research work. India loses millions yearly because its raw materials are exported in an unrefined or unmanufactured state."

It seems to me then that we must completely overhaul our educational policy. We seem committed to it. We have not, it is true, access to the purse of Fortunatus, but nevertheless we must set wide the gates of our Universities. In this every day world of ours workers must be helped by the

Universities. Without becoming purely utilitarian the Universities must teach applied science and keep in closest possible touch with the whole realm of industrial and commercial advancement. Indian Universities, especially those in large centres of population, will have to be truely civic Universities. In their activities they will be many-sided. The teaching of technology and the encouragement of research will divert the mass of students from purely literary pursuits to the study of and command over those processes of agriculture and industries which bring material prosperity to India. As His Excellency the Viceroy said* some weeks ago, "We want Indian men, and not Indian men only as labour but as leaders who will turn their attention to industrial enterprise and equip themselves for a great industrial re-generation in India. We want to see men devote themselves to scientific research. We want to divert some of the great stream of students, which now pours into channels leading only to the clerical and legal professions, into channels which will lead to industrial and commercial enterprise. We have now before us the Report of the Industrial Commission which tells how this may be done. I can assure you that in the case of this Report, too, I have no intention of letting its volumes moulder upon our shelves. Action has already been taken upon it, and before a year elapses I hope to see the foundations laid of a scheme for progressive industrial development in India. But let me once more emphasise the point that it is men that we want to do this thing." The *effectiveness* of the factors of production on which I have laid perhaps excessive stress is of superlative importance at the present time. When it is remembered that 94 per cent of the population is illiterate as compared with 1·8 per cent in England and Wales, 1·6 per cent in Scotland, 17·4 per cent in Ireland, and 7·7 per cent in the United States and that it is only in the higher education of boys that our statistics will stand comparison with European countries, with America, and with Japan, the importance of more and better education as a means of improving the effectiveness of our industrial powers can scarcely be over-estimated.

* Convocation Address—Calcutta University—16th December, 1918.

FORMATION OF IRRIGATED PLANTATIONS.

By L. P. Mascarenhas,

District Forest Officer, Mysore South.

Having read an article by the Editor in the *Economic Journal* for December 18, on 'Fuel and Fuel Substitutes' and another on the same subject in the *Mysore Forest Association Journal* for October 1918, by Mr. H. Srinivasa Rao, retired Deputy Conservator of Forests, I have been tempted to send a small note on the formation of irrigated plantations, which can be easily opened with the abundant water supply available in Marikanave and Krishnaraja Sagara Reservoirs.

Taking the fuel question in Bangalore, the Editor of the *Economic Journal* clearly describes the difficulty experienced by the people in getting their fuel for every day consumption; similar is the case in Mysore also. When such is the difficulty for getting fuel for ordinary purposes, what prospect is there of obtaining timber fuel and charcoal for industrial pursuits. Our forests are situated miles away from towns and from tracts where industrial pursuits can be followed with labour convenience.

The Vedic hymns afford evidence that at the time the Aryans were entering their new Southern home, India was covered with magnificent forests; but with increasing population, extension of cultivation and multiplication, valuable fresh areas have been laid bare and the State has now to interfere in the way of stocking bare wastes and meet the wants of the people.

Formation of fuel plantations by the Forest Department and also private people was undertaken on a large scale in the Districts of Bangalore, Tumkur and Kolar and the species used was Casuarina, the beefwood of Australia, the chief reason for this extensive planting was the demand for fuel by the Mysore State Railways before coal was used. Unfortunately this hobby of raising fuel plantations did not spread out into the Mysore District, which had forests so close and fuel was brought into the town of Mysore very cheap. Time has changed the situation entirely and the people are now feeling the pinch.

The Sandal Oil Factory, Mysore, has been consuming a lot of fuel at present—all the available tree growth in swamps and glades nearby Mysore has been utilised and the people have now to depend on fuel brought from forests miles away; transport charges are exceedingly heavy in the absence of Railway communication.

With rough statistics available *re* consumption of fuel in the Mysore city, it is found that from November to end of May nearly one hundred tons of fuel are brought every day as also four to five hundred head-loads in addition; in the rainy season about fifty tons and two hundred head-loads come in.

Only a little of this quantity is brought from State Forests and all the rest from private holdings—the ryot just for the sake of a few rupees clears away all available tree growth in the land without knowing the ensuing danger.

What has happened in the country now is that all good land excluding bare and rocky waste has been utilised for cultivation and the existing tree growth cut away; now the stocking of these bare wastes with fuel trees is a difficult problem.

Insufficiency of rainfall is one of the greatest obstacles to the stocking of bare wastes. Such being the case, wherever the Canal Department has water running to waste or natural facilities exist for the construction of effective system of irrigation works and the requirements of the population in respect of Forest produce are insufficiently met, these irrigation works should be resorted to without hesitation, as the certainty and rapidity of success will repay over and over again the special outlay entailed.

The city of Lahore suffered for many years without fuel but the Forest Department came to its rescue by opening Sissoo plantations in 1866 under the Bari Doab Canals. The Punjab Forest Department has now taken up this work in right earnest since 1910, and opened of nearly 35,000 acres of plantation under the irrigation system. These plantations require two or three waterings in summer and Kannambadi can afford it whereas Marikanave with its large storage of water unused at present will welcome them.

It is high time, therefore, that a few Forest Officers are sent to Punjab to study this system.

LIFE ASSURANCE IN INDIA.

By "J."

THE fifth annual issue of the Returns from Life Assurance Companies doing business in British India published by the authority of the Government of India from the Government Central Press, Calcutta, at a price of Rs. 1-8-0 per copy is a useful volume full of interesting information. The returns contained in the volume appertain to the year 1917, and the publication consists of abstracts of accounts and valuation statements with an introductory note by Mr. Meikle, the Government Actuary. Both in form and arrangement the fifth issue is a great improvement on its predecessors. When after the promulgation of the Government of India Life Assurance Companies Act VI of 1912, the Government Actuary undertook to publish the returns of the various classes of Life Assurance Companies in India in one volume, the task was undoubtedly one of considerable difficulty. There were in the first place Indian companies as well as British, Colonial and foreign companies doing business and in the second place the Indian companies in themselves consisted of concerns of diverse classes, of varying magnitudes and of different methods of organization, work and account-keeping. To reduce the returns of all these to a system, print them in one volume and make them the subject of a useful and intelligent review was a task which required not only a high degree of expert acturial training but also demanded infinite patience and an intimate knowledge for the psychology and inner currents of Indian company management. But the task has been attempted by Mr. Meikle with a degree of ability, tact and sympathy which cannot but excite admiration and after a perusal of the fifth issue of the annual compilation we can confidently say that the task

has been accomplished with a fair measure of success.

In this year's publication the admittedly cumbrous method of the former issues has given place to a form which is at once more comprehensive and more convenient for purposes of reference. We particularly appreciate the form adopted for shewing the life assurance revenue accounts of each of the Indian and non-Indian companies which shews at a glance not only how each company compares with others as regards a particular head but also shews how the result of the year under consideration compares with the corresponding figures of previous years relating to the same company.

Turning now to the subject matter of the returns we find that the progress of life assurance business in British India during the year 1917, was fairly satisfactory. The new sums assured by Indian companies under ordinary life assurance policies during the year under review shew a considerable increase, the total amount being nearly 224 lakhs as against 190 lakhs in each of the two previous years. In this connection one interesting fact may be noted. Endowment assurance policies constitute the most popular form of life assurance in India about 77 per cent of the total business of 224 lakhs during the year under review consisting of this kind of policy. This proportion of endowment policies to the total insurance policies issued by British companies is only about half of this. This clearly shews that endowment insurance policies are much more popular in India that they are in Great Britian. The reason perhaps is to be found in the peculiarities of Indian character and Indian economic conditions. In countries where the population is more energetic and enterprising and various industries flourish in a high degree life assurance is chiefly resorted to as a protection to the family against the contingency of *death*. The individual has confidence that as long as he lives he can manage somehow to earn a decent living and insurance is not availed of to a large extent as a method of investment and laying by savings for which there are numerous other ways open. The Indian on the other hand is anxious to utilise life insurance as a method of laying by his savings and is anxious to secure the possibility of getting the insured sum during life time even by paying a considerable amount of extra premium.

The total sums assured including bonus additions, under ordinary life assurance policies issued by Indian companies have increased by over 5 per cent during the year and amount to over 24 crores of rupees. This figure is interesting as it works to less than a rupee per head of the population. It is true that this total of 24 crores does not include policies issued by non-Indian companies but it has to be remembered also that the policies issued by companies working in British India include a considerable number issued on behalf of inhabitants of Native states. In this view, the conclusion that the average amount of life insurance per head of population in India is less than a rupee seems to be well warranted. This conclusively shews how vast is the field that still remains to be worked by life insurance organizations working in India. In fact, it may be said that in India the operations of life insurance have not yet permeated to the masses of population except Mysore where the State is trying to carry the benefits of life insurance to the masses by opening a State Life Insurance Office in which even the poorest cultivator, artizan or labourer may take a small life policy under conditions suitable to men of his class, we know of no other part of India where any such attempt has been made. If life insurance is a blessing to the higher and middle-classes it is a far greater blessing to the poorer classes. Though the work done by the Life Insurance companies in India has been of considerable economic value from the point of view of welfare of the population, it has to

be admitted at the same time that their work has only touched the fringe of the population and that it has not yet extended to the classes who are most in need of the benefits of insurance.

One of the most beneficent results of the working of Indian Life Assurance Companies Act, 1912, is, as can be made out from the Report of the Government Actuary, the gradual extinction of unsound companies and the better and the more economic management of the sound ones. This is shewn by a gradual reduction since 1913 in the ratio of the total expenses to the life assurance premium income. This ratio steadily fell from 23'8 in 1913 to 20'2 in 1917. In the United Kingdom, however, the ratio of expenses to life insurance premium is only 13 per cent. The policy holders of insurance companies in India may, therefore, look forward to a further reduction in the ratio of expenditure, in years to come.

It is a matter of regret that the insurance returns of British India have to remain incomplete in many respects owing to a defect in the Indian Life Assurance Companies Act. Thus, neither the total sums assured remaining in force nor the total amount for which policies are issued each year in British India by all companies can be stated, as unfortunately particulars of this nature are not required to be submitted by the British companies and by some of the other companies which transact business both in the United Kingdom and in India. Why this should be so, it is difficult to understand. It is very necessary that the Act should be modified so as to require all companies doing business in India furnish statistics regarding the extent of business done by them in this country.

In his introductory note, the Actuary again explains, as he did last year, that the depreciation of securities is not such a serious blow to life insurance companies as many may imagine. In the first place the income of most companies exceeds the outgoing and consequently there is no occasion for securities having to be realised immediately. In the second place, the depreciation of securities is accompanied by a considerable rise in the effective rate of interest which goes far to counterbalance the decrease in capital values at the time of an actuarial valuation of the financial position.

The Government Actuary brings to notice that whereas most of the Indian companies established during the last twenty-four years are proprietory companies with a share capital, the older ones are mostly mutual companies. As the Mutual companies generally have very small funds, Government are inclined to shew some concessions to them. Thus Government will be prepared to consider any application from an Indian Mutual company for permission to pay a deposit smaller than the full deposit prescribed in section 4 of the Life Act and will also permit them to employ as auditor the holder of a restricted certificate while the other companies are required to employ as auditors the holders of unrestricted certificates only. It is also pointed out that one or two of the existing life offices are called "Mutual Companies" though they have share capital and are proprietory in their nature. Such confusing nomenclatures should be avoided.

A few years ago, a very large number of Provident societies suggestive in their names of being ordinary Life Assurance companies were started in all parts of India. There were a very large number of unsound societies among them, and there is no doubt that the spread of life insurance in India was greatly hampered by the operations of these societies. Thanks to the operation of the Life Assurance Companies Act and the Provident Insurance Societies Act, the operations of unsound provident funds and life insurance societies have been controlled to a very great extent. About twelve years ago there were about 1,200 Provident insurance societies in India. Now only about forty-five

remain. The unsound ones worked on the principle of the dividing societies. At present there are two acts of the Government of India, one relating to the Life Insurance companies and the other to the Provident Insurance societies. A company is subject to the Life Act and not to the Provident Act if under insurances payable at the death or survivance of any one life, it undertakes either to pay sums which in the aggregate exceed Rs. 500 or receive premium which exceeds Rs. 25 in any one year or Rs. 250 altogether.

There are several remarks in the note of the Government Actuary relating to institutions within the Mysore State. The All India and Burma Provident Fund of Bangalore is one of the four Life Assurance companies in India which continue to issue policies on the dividing principle. Mr. Meikle is no admirer of schemes of dividing insurance. In fact, he says that this form of insurance is the curse of insurance enterprise in India. All companies which are doing insurance business on the dividing principle or which may feel inclined to undertake this kind of work will be well advised to read the sound advice given to them by Mr. Meikle in his note.

Of another Mysore concern, the Government Actuary writes in his note as follows:—

"..................... This Company's head office is in the Native State of Mysore. The Mysore Government is, however, in no way concerned with the Company and by a notification dated the 23rd December 1914, published in the *Mysore Gazette*, it announced that the use of the words "Mysore Government" in the name of the Company did not mean that the Mysore Government authorised its formation or in any way supervised its business.

"This Mysore Company for about a year past has endeavoured to transact insurance business of the Dividing Society type in British India. By keeping its life assurance contracts within the limits prescribed for Provident societies, it first of all escaped compliance with the Life Act and by only having canvassers working in British India and so restricting their powers, it endeavoured to escape compliance with the provisions of the Provident Insurance Societies Act. On being informed that this could not be done it has decided to issue policies which make it subject to the Life Act........."

Another matter to which attention is drawn by the Government Actuary in his note is the selection of Agents. He points out that the companies are responsible to a great extent for the action of their agents and it is therefore of the greatest importance that only men of unimpeachable integrity should be employed by companies to act as agents on their behalf. This is necessary in the interests of the companies themselves, of the policyholders and of the progress of life insurance work in India.

Life insurance is an economic necessity of modern society. It is as necessary in India, as in other parts of the world. In fact as the people of India are poorer than the people of other countries, the necessity for a system of life insurance suitable to the masses is greater in India than elsewhere. It is a remedy against many of the evils to which society is liable. It is an institution which makes a man happy and contented and makes his relation with others more cordial and friendly. It enables a man to feel relieved of burdens and moral responsibilities which would otherwise weigh heavily on him and make his life unhappy and miserable. It is one of the triumphs of modern economic organization which has already achieved far reaching results and promises to achieve far more in the future in respect of the individual, the family and the society as a whole. Now that the war has closed and India has once more resumed her journey in the path of economic progress, it is to be earnestly hoped that this useful department of work will not be lost sight of by those charged with the duty of fostering the material and moral advancement of the country.

REVIEW OF THE TRADE OF INDIA IN 1917-18.

MR. Findlay Shirras' Report reviewing India's trade in 1917-18, which has just been issued by the Department of Statistics, India, is a document which deserves to be, and doubtless will be, studied with every attention alike by the business world and economists generally as it points out roughly future developments and the lines on which progress in trade is likely to take. The Report begins by pointing out that " for the fourth year in succession the Review of the Trade of India has been written amid the tumult of a world at war. Three years ago few of us dreamt that India, being far distant from the titanic struggle in Europe, would have experienced the great changes that have taken place in her commerce and industry. In commerce the continuous demands on the part of the Allies stimulated the export of commodities of vital or national importance, and at the same time altered the direction of trade; in industry necessity was the mother of invention, and the war has been a great impetus to industrial development. The share of manufactured goods in the export trade of the year increased to 31 per cent from nearly 24 per cent, the pre-war average. Owing to the phenomenal shortage of ocean freight and the restrictions in the outflow of merchandise in various ways, India (which had held before the outbreak of war the second place in the Empire's trade, next only after the United Kingdom) gave pride of place to Canada." The value of the overseas trade in merchandise was nearly Rs. 393 crores as against Rs. 395 crores in the previous year and Rs. 370 crores, the pre-war average. In exports of merchandise there was a decrease of 1 per cent, while imports were approximately the same in value as in the preceding year. Prices have had a great effect, as was to be anticipated, in the value of the trade. Had the prices of the previous year prevailed, the value of the import trade would have been Rs. 122 crores instead of Rs. 150 crores, and that of the export trade Rs. 216 crores instead of Rs. 233 crores. Import prices rose, as compared with the previous year, 23 per cent, while exports rose 8 per cent.

During the year India sent goods to the value of Rs. 127 crores to the United Kingdom and other parts of the British Empire and Rs. 90 crores to the Allies. The bulk of the exports to the United Kingdom and her Allies consisted of articles of national importance. The quantities exported of food grains especially wheat, barley, and gram, jute manufactures, tea, and tanned hides considerably increased as compared with the exports in the pre-war period. The total value of food grains exported amounted to nearly Rs. 54 crores as against Rs. 46 crores, the pre-war average, and of this amount wheat accounted for Rs. 19 crores. The export of jute manufactures was valued at approximately Rs. 43 crores as against Rs. 20 crores in the pre-war quinquennium, while tea was exported to the extent of Rs. 18 crores, the pre-war average being Rs. 13 crores, and tanned hides Rs. 5 crores as against only Rs. 1½ crores in the pre-war period. As the Review points out " War time prosperity has, so far as our industrial activities are concerned, continued to bring grist to the mill. The trade returns of the year are surprisingly good considering the restrictions prevailing upon exports, and the difficulties of freight and finance." This is well illustrated in the statement of Bank Clearings, which reflects the activities which the country continues to experience mainly, if not wholly, as an outcome of conditions in Europe. Company flotations similarly illustrate this industrial prosperity. Prices of securities and shares show a general increase so far as industrials are concerned, while there was a decrease in the market price of Government securities and Municipal debentures.

Of the detailed analysis of India's trade in 1917-18, it is difficult to write an adequate summary. In cotton piecegoods, India's largest import, there was a decrease in quantity coupled with a large increase in value. The share of the United Kingdom in grey goods decreased to 87·2 per cent from 98·8 per cent in the pre-war quinquennium, in coloured goods to 91·8 per cent from 93·5 per cent, while that of white goods increased slightly to 98·8 per cent from 98 per cent. Indian mills showed an increase in the production of finer varieties of cotton fabrics, particularly coloured goods, and also an increase in the production of high counts of yarn spun. Japan considerably increased her share in the imports of cotton piecegoods, the quantity imported from Japan in 1917-18 being thirty times that in the pre-war period. Next to cotton piecegoods sugar is India's largest import. The total imports of sugar were 7 per cent larger than those in the previous year and Java continued to be the principal source of supply. The review on the iron and steel import trade illustrates how great were the demands on the part of the Allies for the manufacture of iron and steel into munitions of war. The total imports were less by 79 per cent than the pre-war average. The value of the imports of railway plant and rolling-stock was only one-ninth of the pre-war quinquennial average. Kerosene oil was imported only to the extent of 31 million gallons as against 49 million gallons in the previous year and 67 million gallons, the average imports before the war. An interesting feature of the year's trade in mineral oil was the increase in the imports from Persia. In the imports of provisions, an interesting change in the direction of trade has taken place as Australia has increased her share in the imports of biscuits from 5 per cent during pre-war times to 52 per cent in 1917-18, and also increased her supplies of bacon and hams, cheese, canned and bottled provisions, jams and jellies. The United States was the largest provider of condensed milk followed by the United Kingdom, Australia, and Holland. The quantity of brandy imported was 228,000 gallons and of whisky 656,000 gallons. The imports of beer were 1,858,000 gallons as against 2,586,000 gallons in the previous year. A very interesting feature of the trade in beer is that for the first time Japan took the lead, the United Kingdom having hitherto been the largest snpplier. On accoünt of the embargo on imports the number of motor cars decreased by 73 per cent, and the year, like its two predecessors, was the year of the American motor car in India.

In the export trade there were several interesting features which are dealt with in detail in the Review, and these can only receive passing mention here. The chief feature of the year was the large increase of 52 per cent in the value of food grains exported, a result of the unusually good monsoon which is the jugular vein of India's trade. Another feature of the export trade was the increase in the value of raw cotton exported by 18 per cent above that of the previous year. The exports of jute manufactures amounted to nearly 720,000 tons, valued at nearly Rs. 43 crores. In three years the jute mills of Bengal have shipped on Government account 1,073 millions of bags and 375 million yards of cloth. Another feature of the export trade was the large decrease in raw jute, seeds, and raw hides and skins. Raw and manufactured cotton was the chief export during the year as was jute in the two preceding years. The exports of tea were the highest on record—359 million lbs., or 35 per cent above the pre-war average. The exports to the United Kingdom were 37 per cent above the pre-war average and the direct shipments to the United States were nearly seven times those of 1916-17, and more than eight times the pre-war average. The effect of the war is writ large on every page of the Review connected with these exports.

In the direction of India's trade the effect of the war has been to increase the trade of India with other parts of the British Empire. The share of the British Empire in 1917-18 rose to 57 per cent from 53 per cent in the pre-war quinquennium. Trade with foreign countries decreased from 47 per cent to 43 per cent. The most interesting feature in regard to the direction of trade is the large increase in the trade with Japan and the United States. Mr. O'Conor, late Director-General of Statistics, wrote in the Review of Trade for 1888-89 regarding the trade of Japan that "Imports from Japan are quite trifling, averaging less than three lakhs annually in the last five years, and there are no indications of an increase unless the imports of copper should be resumed." When the long list of imports at the present time is examined, the progress in our trade with Japan cannot be termed other than phenomenal. In 1917-18 the total trade with Japan exceeded that with other countries except the United Kingdom and was valued at Rs. 52 crores. This was an increase of 400 per cent in imports and 103 per cent in exports over the pre-war average. The value of the trade with the United States had grown to twice what it was in the pre-war period, being second only to that with Japan. Half of the import trade with the United States was made up of iron, steel, and mineral oil, while the trade with Japan was chiefly in the import of cotton manufactures, matches, metals, silk manufactures, and glassware and in the export of raw cotton.

An interesting feature noted on the frontier trade of India is the increase in importance of the Shan States in the production of lead and silver. Owing to the large output of the mines near Namtu the production of refined silver in two years has risen from *nil* to over 1½ million ounces, and the production of refined lead from nearly 7,000 tons to 17,000 tons. In the rail and riverborne trade the statistics of the movements of piecegoods are of considerable interest as these were 60 per cent below those of the pre-war year. Of the consuming provinces Bengal and Madras showed a decrease of 42 per cent each, the United Provinces 28 per cent, and the Punjab 14 per cent. In the net imports of kerosene oil by rail and river, Bengal showed a decrease of 30 per cent, Madras 17 per cent, Bihar and Orissa 14 per cent, the United Provinces 14 per cent, Bombay 7 per cent, and the Punjab 17 per cent. Railway earnings which are always a valuable index to the general movement of the inland trade of the year were 20 per cent above those of the pre-war year and 8 per cent above the previous year.

One of the most interesting features, if not the most interesting, is that dealing with the excess of exports over imports, and the liquidation of this large trade balance which India has enjoyed in recent years mainly on account of the insistent demand on the part of the Allies for her products. The gap between exports and imports of merchandise was £61 millions sterling, as against £63 millions in 1916-17, and £52 millions the pre-war average. After making allowance for the various items the Director of Statistics estimates that net balance was £11,590,000 as against £30,395,000 in 1916-17. A caveat, however, is added that "it must suffice to affirm at the risk of wearying the reader with so many repetitions on this subject that there are more things in regard to India's balance of trade than are dreamt of in the philosophy of the Indian trade returns." The increase in the net imports of treasure was mainly due to large imports of gold, and the statistics of treasure show that India has been absorbing considerable amounts of the precious metals in spite of the war. The absorption of gold during the five years ending March 1918, amounted to more than one-half of the world's yearly production and the net imports of silver in the same period nearly twice the world's annual production.

STATE CREDIT AND BANKING.

By the Editor.

MR. Robert Benson deserves praise for the illuminating book he has produced on *State Credit and Banking* (Messrs. Macmillan & Co., 5 *sh. net*). Originally printed for private circulation, it has been now re-issued to the public as the demand for copies was continuous and persistent. The great value of the book is that it deals boldly with the question of financial facilities and how to find the money requisite for reconstruction purposes. The main issue he grapples with has to do with liquidity of the vast private capital locked up in War Loans. How to liquefy this vast capital? That is the central question he attacks in this book. His suggestion, very briefly put, is that the Banks should establish a Central Institution to make advances on War Loans and that the State guarantee such advances. To those who have invested their money in War Loans, the suggestion ought to prove a welcome one. To those who wish to have capital for reconstruction work, it ought to be equally worth serious consideration. The importance of the suggestion put forward by Mr. Benson will be realized when we remember that over a third, if not quite a half, of the country's wealth is now represented by Government securities, and that any attempt to sell them to the extent required would be impossible without producing a disastrous fall. This by itself is a strong reason why a Central Institution of the kind he mentions and from which holders of war stocks would be easily able to borrow on them is necessary. Mr. Benson foresees the gravest consequences to Britain's fair name and industry, unless Government adopts a policy which prevents any serious slump in its own securities. His proposal, which is set out with a wealth of detail which is all his own, is designed to prevent this disaster. He says: "Freedom and not restriction of the greatest of all markets—the money market—is indispensable if we are to pay our debts, rehabilitate the pound sterling, and re-establish the position of London as the Clearing House of the World."

We do not think that Mr. Benson's position can be misunderstood after what we have stated above. We need not agree with all that he says—we take it that he does not expect that either—but his main proposal is worth enlarging upon, if for nothing else, at least to show how closely he argues his position. For a financial writer, Mr. Benson is skilfully argumentative and even dryly caustic on occasions. His chapters on German banking and reconstruction in America after the Civil War (1861-65) and the Federal Reserve Banking System of 1913 and the experience of France will repay perusal by those interested in banking and credit matters generally.

We would now hark back a little and refer to Mr. Benson's proposal for a Central Banking Institution. Mr. Benson thinks that besides the Bank of England, which is the Bank of the British Empire to regulate the exchanges and the international values of pounds sterling, another Central Institution is required to do for the market in Government securities what the Bank of England does for the Bill Market, *i. e.*, to make our premier security liquid and available as collateral for reconstruction finance, and a larger potentiality of credit for productive purposes. He thinks that the State should come in to guarantee, in case of need, the *liquidity* of loans made by such Central Institution on Government securities, and in consideration of its guarantee should participate in the profits as in the case of the Reichsbank, and as the American Government does in the case of the Federal Reserve Bank. The business of deciding to whom to lend to, for what object, for how long and at what rate, is an art needing trained judgment such

as cannot be got under Government Departments. In a word, he pleads for a further step in the co-operation of State credit without sacrificing the individualism of British Banking. Mr. Benson does well, we think, in disarming his would-be critics by a few words which deserve to be quoted here, for they cannot be better stated than in his own words.

He says: "To some, such a proposal may seem revolutionary, but in fact it is more open to the criticism that it does not go far enough; at least it does not go as far as the German or American banking systems; in both of which bills or "self-liquidating" paper form part of the basis upon which legal tender Notes are issuable. For, while it broadens the basis of credit, it limits it to gold plus Government Securities. It is an attempt to formulate a practicable course under existing conditions. It does not attempt to create a potential supply of pounds sterling comparable to the supply of American Dollars or German Marks, but it preserves the convertibility of our currency under 4 and 5 Geo. V. Ch. 14 and it does not shirk our existing liabilities to pay gold on outstanding options.

"The idea that we pay in gold is deeply rooted in the public mind. It is somehow connected with the idea of national honesty as well as national solvency, and talk of the suspension of the Bank Act scares people as if it were repudiation as well as bankruptcy. But Americans and Canadians who are habituated to paper know that payments are really made in goods and services, while Continental critics regard our claim to pay in gold as a mark of British hypocrisy. The experience of the War may enlighten the public and enable them to realise that the Bank Act is practically suspended already; that the gold standard did not cease to exist when, or because, currency notes were substituted for gold in circulation, but that it really began to yield to the sterling standard when credit was invented and gold ceased to pass from hand to hand at every transaction. The public may come to understand that, in spite of our exportable gold currency, British banking adapted itself to conditions so that what was formerly treated as a measure of value gradually became no more than one among various *media* of Exchange, and that this was an international evolution. They may then go on to see the excellence of Peel's standard coupled with our cheque system really rested on elasticity rather than on restriction to gold; and that restriction to gold was its weakness and a relic of barter. Once again we are up against a condition and not a theory. Perhaps public opinion may now be willing to acquiesce in the broadening of the basis of credit with the assistance of the State.

"What then is our standard? It is, I submit, the pound sterling. But what is a pound? Is it abstract or concrete? Vegetable or mineral? Paper or metal? Some say it is one, and some the other, when in truth it is neither, or rather it is both, *i.e.*, it is a relation between gold and all exchangeable things. It is a relation, which, as a banking system, becomes more perfect, tends to merge into a free relation of all exchangeable things, gold included, to each other. The standard is the residual product of those relations. One might say that its stability is conditioned by instability; and that its honour, rooted in dishonour, stands. *La monnaie à l'etat le plus parfait est de papier, i.e.*, Treasury notes, under safeguards such as we have got already."

The scheme he proposes may now be briefly described. The scheme is for a Central Institution to provide for after-war development by enabling holders of Government securities to borrow thereon and is as follows:—

(a) Capital, say, £100,000 of which 5 per cent to be called up leaving the balance as a reserve liability.

(b) The capital to be held by the ... aks in proportion to

their deposits or as may be agreed.

(c) The object is to be ready always to advance money on British Government Securities.

(d) Borrowers should maintain a margin of (say) 10 per cent; whether this margin should consist of British Government Securities only, or include other good securities, such as Colonials, is open to discussion.

(e) The effect of the working of the Institution would be that it would become indebted to the clearing banks for the amount of their advances.

(f) The State would guarantee the banks' advances in consideration of a share in the profits, and any bank must have the right in case of emergency to demand currency from the State upon the amount of its advance to the Institution.

(g) The advantage to the Banks would be that not only would they be amply secured against loss, but as their advances to the Central Institution would be liquid, their proportion of liquid assets to deposit liabilities would be increased.

(h) The rate of interest charged by the Banks to the Institution should be lower than the rate charged by the Institution. The difference would be the profit to the Institution, divisible between the Banks and the State.

To show the effect of the working of the Central Institution, suppose that the Bank's position were as follows:—

	£			£
Deposits	2,000,000,000	...	Reserves (till money) say	100,000,000
			Balances with Bank of England ...	300,000,000
				400,000,000 *
			Loans, Investments &c.	1,600,000,000
	2,000,000,000			2,000,000,000

* or 20 per cent quick assets against deposit liabilities.

Suppose that the advances of the Institution to customers amounted to £ 1,000,000,000; the banks' deposits and loans might rise by £ 1,000,000,000 each. But as the loans would represent advances by the Banks to the Institution guaranteed by the State in case of emergency, they would be liquid. The balance sheet of the Banks would therefore be—

	£			£	£
Deposits	3,000,000,000	...	Reserves (till money) say ...	100,000,000	
			Balances with Bank of England ...	300,000,000	
			Advances to Central Institution ...	1,000,000,000	
					1,400,000,000 *
			Loans, Investments, &c. ...		1,600,000,000
	3,000,000,000				3,000,000,000

* or 46⅔ quick assets against deposit liabilities,

Possibly the Banks might require to increase their till-money up to the pre-existing proportion, or 5 per cent of their deposits; but as they would cease to receive interest on the amount taken out in currency, there would be a safeguard against their taking out more currency than was actually required to maintain their till-money. Such currency would not be in circulation, and in the above balance sheet would increase the till-money by £ 50,000,000 and decrease the amount of advances to the Central Institution by a like amount. As to the profit divisible between the State and the Banks, if the Institution charged for its advances ½ per cent above the rate it paid to the above

banks, the gross profit on advances amounting to (say) £ 1,000,000,000 would be £ 5,000,000 per annum and the Banks would receive their proportion of this profit as shareholders of the Institution. The position of the Banks would be very much stronger in emergencies in so far as they would be entitled to demand currency for the balance of their advances to the Institution. As to what constitutes an emergency, a practical solution would be to allow the banks take out such currency as would be required to make up their cash reserves to the normal percentage of their deposits. But a much more stringent definition, which would limit the right to draw currency notes to times of financial crisis, might be much more desirable. It must be a paramount object to conserve the value of the pound sterling. Thus the question of the Bank Charter Act comes in, and its suitability to the conditions of to-day when we must be prepared to regulate our finance as if Great Britain was a debtor country and not a creditor as it was in Sir Robert Peel's time. Mr. Benson does not say that we shall be, but some of our loans to Allies may (he thinks) prove irrecoverable (or temporarily so) and make us in effect a debtor country for the time being, because we shall owe more to America, Holland, Scandinavia, and Switzerland than our Allies will effectively owe to us. The First great critic of the Bank Charter Act was Sir Robert Peel himself, in his letter from Windsor Castle dated 4th June 1844. He admitted the contention of the Governor of the Bank and of Mr. Bosanquet and others that his Act was liable to be too rigid, as in fact it proved to be in 1847, when he himself sanctioned its suspension. He preferred to err on the side of over-rigidity, saying that he expected men able to deal with emergencies to arise, along with the emergencies of the future. He was right, for in 1857 and 1866, when solvent debtors were on the brink of ruin because they could not get money even at 10 per cent, men arose again to demand suspension; again in 1890 and 1907 we had to fall back on the support of the Bank of France: and yet again in 1914 on the outbreak of War men arose to devise currency notes, for we had not got them ready printed as the Germans had. Later on men were found to deal with the emergency of the American Exchange and finally, in accord with our Allies, the United States, to hold it steady. Since Sir Robert's day the cable has been invented and prices have become international. We are now in the position of having had to entrust the regulation and control of prices and the exchanges, not as Sir Robert Peel said "to individual caution and discretion", but to the State, to manage from day to day until our position as a creditor country is beyond a doubt. Clearing Banks' Deposits have increased from 1,033,000,000 on 31st September 1913, to £ 1,703,000,000 on 31st December 1917, and may amount to over £ 2,000,000,000 by the end of the War. There may be no difficulty about meeting the demand on the part of the Bill Market, nor yet for short loans on quick-turnover collateral;—except in so far as they may mean withdrawals of gold. The difficulty is more likely to arise over the demand for longer loans which are the subject of financial, as distingished from commercial, banking and which are not suitable employment for deposits. The public has plenty of assets to meet the demands of reconstruction, but they are largely locked up as fixed capital, or in War Loans. Hence the need of a sort of pawnshop for Government Securities (a) liquefy War Loans, (b) to assist banks to unload their investments in War Loans, (c) to create a broad and free market and maintain the credit of our premier security. If people find they can't sell, they all want to sell. But if they can sell, or borrow freely, many of them won't want to sell; every fall in price tends to bring in fresh buyers, and to establish a market before confidence is impaired.

So far for the scheme itself, which we ave given, as far as possible, in Mr. Benson's wn words. Now, as to possible objections gainst it. Mr. Benson thinks that at least ve main criticisms may be anticipated, gainst his scheme. These are, in his opiion, (1) Will it cause further rise of rices, *i.e.*, inflation ? (2) Will it stand the train of a foreign drain upon our gold eserves ? (3) Would it in effect mean bandoning our free market for gold ? (4) s it required ? May we not find ourselves vith too much money after the war instead f too little ? and (5) Would it contribute o speculation, honeycombed credit, and anic ? He meets each of these possible bjections in a perfectly straightforward anner. We can only indicate here his nswers to these objections. He inclines the view that the first objection is a roundless one. If inflation exists at preent, he says, it will be followed by eflation after war (the book was written uring the war), which has its own pecuar difficulties and dangers. To the Banks particular it means an increase in e proportion of their invested assets to heir quick liabilities, unless they can unload hose investments, or borrow on them in ase of need. To producers and distributors, alling prices mean readjustment of everyody's share in the price of the product, and nless costs can be readjusted *pari passu*, ock-outs and strikes follow, and loss. Any ower of graduating the inevitable fall of rices which will come as peace production vertakes war consumption, is to the good. Good banking largely consists in keeping hings moving on, so as to avoid congested pots and sudden breaks. Incidentally a anker has to teach some customers to sell nd repent. As Mr. Benson rightly observes, many of our after-war difficulties can be olved only in the course of experiment. As egards the protection of the Gold Reserve, Mr. Benson states that the respective gold oldings of our neutral creditors, Spain, Holland, Scandinavia, and Switzerland in their State Banks have increased from £51,100,000 in December, 1913, to £190,800,000 in June 1918, while the gold reserves of the American Federal Reserve Banks have increased from £46,530,000 in December 1914, to £380,000,000 on 31st May 1918, without counting gold in the United States Treasury and in circulation. Suppose, he asks, our floating debts at call or short notice were to amount to £250,000,000 at the end of the War, will the money be wanted on the nail in gold, or will it, or a proportion of it, be kept in London or invested in England till it can be taken out in goods ? Probably the latter, Mr. Benson thinks, if our neutral creditors see that we have faced the situation and that, if they want gold, they can have it. The war has proved, he adds, the futility of trying to meet adverse balance of trade by gold : no belligerent except perhaps America will have enough of it to pay in gold, and some creditors will not want more gold. In short, is any drain of gold probable except perhaps to America ? America's interest will be to carry her debtors till she can be paid in goods and services and not to upset their finance. A good banker does not begin collecting debts by forcing customers to liquidate. As to Germany she is most unlikely to be able to command gold ; she is more likely to have to part with it in order to get raw materials. As to the third possible objection, whether the scheme would in effect mean the abandoning of our free market for gold, Mr. Benson thinks that there will not be any free market for gold for sometime after the War. Government control can only be gradually relaxed over exports and imports, issues of capital, foreign exchanges and gold movements. Possibly gold will move about from centre to centre much less than heretofore, especially within the Empire, and the Anglo-Saxon world. He thinks also that it is possible to have a British Empire controlled rate of exchange. He further doubts whether we shall be able to allow a return

to a gold currency for sometime to come, and whenever we can afford it (he adds) the utility of gold will be greater in the Bank of England in connection with exchanges, or for window dressing purposes in connection with Currency Notes than in our pockets. By the time we can afford it, the public may have concluded that a sterling standard is best, combined with a paper currency, *i.e.*, Currency Notes, convertible to prevent any possibility of over issue, as they are now.

In answering the next objection, whether such a scheme as the proposed one is at all necessary, Mr. Benson fully examines the question whether we shall have too much money or too little after the War. Some might argue, he says, that considering that there are already £ 320,000,000 legal tender notes outstanding, and that deposits may easily amount to £ 2,000,000,000 by the end of the war, there will be too much money about instead of too little. This argument, he holds, is fallacious. One cause of the expansion of Bank deposits is the increased investment by the Banks in Treasury Bills, Exchequer Bonds, War Bonds, etc., including "Ways and Means advances." When the Government begins to repay Treasury Bills, etc., raising the money either by taxation or by issue of war loans placed with investors, deposits will automatically contract as the Government repays the investiments held by the Banks. Another cause of expansion of Deposits is the rise in prices of commodities which necessitated larger advances to finance trade. When prices of commodities begin to fall deposits will also begin to contract. Lastly, in the happy event of there being too much money about, people would not have to go to the proposed Central Institution. It would be a safeguard in reserve. Credit is not created unless it is required: it is not a supply forced into circulation. There is no equation between the potential supply of credit and the actual demand. The British Banking System, moreover, has no potential supply of credit as the American one has under the Federal Reserve System; on the contrary, the contraction of deposits is possible as and when commodities fall to normal prices. By that time every manufacturer and merchant who carries his stock by means of bills or loans from his bankers may have to borrow only half as much as he is borrowing to-day and bills and cheques may be drawn for only half the war-time figures. In so far as expansion of loans and deposits have been an *effect* of rise of prices, so fall of prices will automatically be followed by construction of loans and deposits. Further, the increase in Banks' investments from £223,000,000 on 31st December 1913, to £529,000,000 on 31st December 1917, or from 20.2 to 28.5 of their deposits, is no true correlation of factors which rise and fall together. As deposits run down, the proportion of investments will bulk larger and impair liquidity; Banks will want to unload at the same time as others whose money is temporarily invested in Government securities, and if nothing is done to prevent it there will be a collapse, for the price of Government stock depends upon the market and whether money is surely obtainable to carry it for a probable profit until it can be distributed. Finally in regard to the objection whether the proposed Central Institution would contribute to speculation and panic, Mr. Benson first remarks that inflation of currency is not so difficult to guard against as inflation of credit. If credit, as created by the proposed Institution, is used only for the production of real goods and the performance of real service, *i. e.*, to support gennine productive enterprises not speculations, there will, he thinks, be no inflation. As to the risks of speculation getting beyond control and creating fuel for panic, that is always with us, and the remedy is largely a question of good banking. Mr. Benson argues that man will never be quite master of his own credit machine; but, however this may be, there will have to be

more control over Stock Exchange quotations and issues henceforward, also over the direction of investment and customers' operations. More care will have to be taken to see that the working man and the little public generally do not lose their savings in the wrong sort of speculations. We have got, he says, to mend our haphazard ways and control the activities of the Company promoter, whose object is to trade in watered stocks, unenforceable securities, gambles in mining or other counters. Employment and production are the first conditions of national solvency. There is something to be learnt, he adds, from the German policy of conserving national savings for productive purposes through the great Banks, each with its group of smaller banks and their respective customers. Mr. Benson's chapter on the Reichsbank, the Darlehenskassen, the Joint-stock Banks, and the Stock Exchanges deals with this aspect of German organization and is worth of close study by every one interested in banking and finance.

We have indicated above Mr. Benson's general position and how he buttresses it must also be clear to our readers. They will find his book a most suggestive one, whether from the theoretical or the practical point of view. To it we should refer those who want to have a clear idea of what he means when he concludes the last chapter of his book thus:—"Freedom and not restriction of the greatest of all markets—the money market,—is indispensable if we are to pay our debts, rehabilitate the pound sterling, and re-establish the position of London as the Clearing House of the

ECONOMICS IN THE WEST.

Industrial Commission's Report.

London, December 11, 1918.—The report of the Indian Industrial Commission which has just been made public here contains so much that is interesting and suggestive that it is unfortunate its issue should have coincided with the height of the general election campaign. Notoriously the British public will not give attention to two subjects at a time and in the *hurly burly* of the contest I am afraid that the highly important proposals of the Commission will escape the attention they deserve. Nevertheless, there is a sufficiently alert section of the people to read the excellent summaries of the report published in the papers and to grasp their significance from the standpoint of India's future. They especially realise what a revolution in policy the report foreshadows. Gone are the days of *laissez faire* when it was nobody's business to see that India was industrially equipped for the world competition which is before her as one of the greatest producing areas in the universe. No longer is the Government to stand aside while peaceful penetrators are monopolising her raw material presently to return it to her in the form of manufactured goods for which she has to pay a high price. There is, if I read the report aright, to be a new era in which Indian industries are to be fostered and encouraged by financial and technical assistance, and the Government is to see that wherever possible India's needs for manufactured supplies for official purposes are to be satisfied on the spot. In this programme we have a revival of the policy which was brought forward during Lord Ripon's administration. But the idea underlying the existing proposals is much more practical as it provides for the setting up of Indian industries as well as for the sale of their output.

Not the least satisfactory feature of the report is the provision made for the technical

instruction of the masses by peripatetic demonstrations. Conservative as the Indian villager's mind is it is sufficiently progressive to grasp the value of appliances and operations which clearly tend to his material advantage. Even labour-saving devices will make an appeal to him where they are not too complicated or costly. The truth is that India like the rest of the world is changing in these momentous times. Less readily, perhaps, than some other countries but not less surely she is advancing towards the light of the new civilisation in which science will take a prominent place. I entertain little donbt myself from my knowledge of Indian life that if the Government does its duty by this report that the position of Indian industry in a few years will be vastly different from what it is to-day. But it would be idle to expect that the transformation is to be effected by the mere waving of the official wand. As the Government attitude has changed towards industrial trade so must that of the people and especially of what, to use a popular phrase of the day, is called the *intelligentsia.* Education of the higher type must no longer be so largely conferred to producing officials and lawyers. It must have quite as much to do with training men who will fit to be future Captains of Industry and worthy transmitters of the ancient tradition which made Indian manufacturing art second to none in the world. Some decades since the popular cry in the centres of Indian thought was "India needs more Ripons:" to-day it might very well be "India needs more Tatas." Examples such as that set by the lamented pioneer of the great steel undertaking are of inestimable value.

The Value of Propaganda.

We hear a great deal about the value of State propaganda in these days and I would wish that the Indian Government authorities were more alive to the importance of keeping before the British people the resources and industrial potentialities of India. The ignorance here as to what India has done and is doing is really astonishing. When I chanced to mention to a friend of great intelligence and widely informed but untravelled the fact that India's steel industry had supplied the whole of the rails for the great network of railways in Mesopotamia he was astonished. Equally it was news to him that Bombay was supplied with power and lighting from a hydro-electrical installation deriving its energy from the Western Ghauts sixty miles away. He, I believe, is typical of the average home staying Englishman. He is ready and even eager to be interested in India, but he has few means of ascertaining in a direct way the facts which are patent enough to all who are acquainted with the country. The Society of Arts through the medium of its illustrated lectures does really splendid service in extending knowledge of Indian developments. But it appeals to the select few, mainly to those who have a pre-knowledge of India and are intimately acquainted with all the leading facts concerning her institutions. What is needed is a direct popular appeal made through the same agencies as other parts of the Empire freely employ. At the present time alone among the overseas dominions and territories in the Imperial constellation India has no shop window in London to tell the passer by in language which the most ignorant could understand the character of her resources. Yet what possibilities there are here of bringing our modern democracy into touch with the great problems of Indian Government and the character of Indian commerce! I think I can almost see the horrified look which will pass over many official faces when they read the suggestion that India should descend to window dressing to make herself known. But those who decry the employment of the arts of propaganda in the interests of Government are behind the age. For good or ill popular propaganda has come

to stay and no administration, however dignified it may be, can afford to neglect it.

In writing of the value of propaganda I am reminded that within the past few days there has been issued the report of the Civil Aerial Transport Committee in which a strong recommendation is made that steps should immediately be taken under official auspices "to establish a system of propaganda throughout the Empire in order to convince the whole nation of the vast importance and possibilities of aerial transport and to familiarise the Governments and the local authorities with the subject." Here we have a definite proposal formally made for the employment of popular methods, and I do not doubt that it will be acted upon. Sweet, indeed, are the uses of advertisement! But, of course, the Civil Aerial Transport Committee's report only dealt with propaganda as an incident in the examination of a great question. Its main conclusions deal with aerial navigation in its manifold aspects and attempt an elucidation of some of the difficulties with which the establishment of a civil aerial system is confronted. One of its suggestions is that there should be uniformity in the air laws of the Empire. They are also strong in their recommendation of a co-ordinated effort to establish suitable landing grounds along possible routes. In regard to oversea traffic the Committee point out the great suitability of India and the dominions as fields for the development of civil aeronautics. In countries of magnificent distances such as Canada, Australia and India, and notably also in Africa, they would have remarkable scope as a means of ordinary travel and transport, and they would, besides, be of high value for purposes of exploitation and survey. Whether the new aerial service should be under private or State auspices is a matter which the Committee do not venture to trench upon. But they strongly urge that the Government should without delay come to a decision on the point. The whole report makes interesting reading and it should soon be followed up by official action. Already other countries are moving in the direction of the establishment of regular aerial services. Even Germany, despite her broken condition, is in the field with a combined Zippelin and aeroplane scheme of transport.

THE FUTURE OF BRITISH TRADE.

What is to be the future of British trade? Many answers to the question are being given, but I have read none which is more instructive than that given recently in a Sunday paper by Mr. W. G. Faulkner. The writer points out at the beginning of his article that the trade boom is an inevitable corollary of a great war. It was so in the case of the Napoleanic wars after which our industrial system found its opportunity. After the Civil War the United States found itself industrially, and it was in the years immediately following the Franco-German War of 1870-71, that modern Germany was founded. Admittedly there will be a great opportunity offered and it rests with our working men, according to Mr. Faulkner, whether it is taken. If pre-war conditions are reproduced the prospect is not an encouraging one. Our workmen then produced per man per annum £187 worth of goods against £517 recorded in the case of the American working man. The war, however, has revealed to such an extent the advantages of mass production on scientific lines as to forbid the idea that we can ever return to the state of things obtaining before the war. For example, "at the beginning of the war a London Factory Manager hesitated about pledging himself to produce weekly 10,000 finished parts of an appliance. He revolutionised his methods of production and 250,000 finished parts of the appliance were sent out weekly by his factory." Another interesting fact worth noting is that in spite of shortage of labour we have doubled our output of steel increasing the manufacture from 7,000,000 tons a year to 14,000,000 tons. Mr. Faulkner's conclusion is that capitalist and worker must go with the flood which is sweeping away age worn methods. New occasions teach new duties; everything is becoming new. "We have spent

£10,000,000,000 on the war. We have now to consider how much we shall spend on peace. We could spend another £1,000,000,000 in developing the productivity of all our industries, sure that it could return rich dividends to every class in the community in greater purchasing power not only of the productions of our own country but of those of other countries."

It is being made clear that the trouble that lies ahead for British industry is not solely in the domain of labour. Employers everywhere are showing a restiveness against Government control. The necessity of official supervision during war is admitted, but it is boldly claimed that the experiences gained during the past four years show how completely unsuited to successful business is official direction. At the first general meeting of the British Federation of Iron, Steel, Tinplate and Metal merchants recently held great stress was laid on this point by the various speakers. The Chairman declared that a continuance of the control "would be disastrous to trade." Another speaker observed that "if this couutry was to be dependent for its vital necessities on some permanent official of the Board of Trade then its days were numbered." Finally, Sir Johnstone Wallace the Chairman of the Federation asserted that "if there was to be a continuance of the hampering methods which they had experienced, there was a sorry day ahead for British Trade." Unanimity of sentiment could hardly go further than in these utterances: and that the speakers voice the opinions of the community at large I entertain no doubt. Yet that the shackles will be speedily removed from industry is problematical. Labour is clamouring not for less but for more official control of industry. In my own constituency one of the candidates who is appealing for the suffrages of labour demands a system of National workshops. The poor man has probably never read the dire results which followed from national workshops in France in 1848. But it is the kind of stuff that tickles the ears of the groundlings and until the general election is over and labour finds its place, which I think will be at the bottom of the poll, we shall not find the Government anxious to relax its control of the industrial machine.

INDUSTRIAL NOTES FROM THE UNITED STATES.

The World's Greatest Mining Enterprise.

Washington, D.C., U.S.A., 13th Jan. 1919.—Speaking in terms of mere bigness, what is the greatest engineering enterprise in the world? The Panama Canal? Guess again. The subway system of Greater New York? No.

The greatest engineering enterprise ever known in the world is in the state of Utah, in the north-western section of the United States. It is a copper mine in Bingham Canyon—the largest ore producer of any metal mine in the world, yielding 150,000,000 pounds of metallic copper annually.

All the gold mines of the witwatersrand in South Africa put together have not developed so large an ore body. Nor has the biggest of all the enormous iron mines of the famous Mesaba Range brought so vast an ore body into view.

Whole mountains on both sides of Bingham Canyon are terraced from top to bottom with the workings of this wonderful copper mine. The terraces are like so many shelves running around the mountains, and are designated by letters, from "A" at the bottom level to "W" at the top.

Roads of only four per cent grade enable locomotives to draw trains of ore cars from the bottom to the top. Steam shovels scoop up the blasted rock and load it aboard the cars, which carry it to the stamp mills, where it is smashed to powder as a preliminary to the extraction of the copper.

The rock is granite. If you were to examine a piece of it you would not suspect that it contained copper. As a matter of fact, it holds an average of less than one and a half per cent of that metal—in other words, not so much as thirty pounds to the short ton of ore. The ore is of such low

grade that the mining engineer of a couple of decades back would have regarded it as absolutely hopeless to bother with.

But it happened that fifteen years ago an enterprising person named Daniel C. Jackling came along and looked over those mountains. He made up his mind that, if operations were undertaken on a sufficiently large scale, the ore deposits could be profitably worked. Here, in fact, was the vital point upon which success depended. It is the bigness of this engineering enterprise that has made it pay, the cost of handling each ton of ore and extracting the copper from it being thereby reduced to a minimum.

The copper is separated from the powdered rock by at least three methods. One of these is the utilization of gravity, the metal being heavier than the rock particles. Another involves the use of acids to dissolve the copper.

Next after gold and silver, copper is to us the most interesting of all the metals. Fresh and free of corrosion (as seen in a newly minted coin) it is really more beautiful than gold, having a more colorful and brilliant lustre. It is incomparably more useful than gold, serving as it does a vast number of employments for which there is no satisfactory substitute.

A Laboratory on Wheels.

While protected from permanent loss through delivery of bad rails by the steel manufacturers, a railroad, it has been found, may suffer serious temporary embarrassment from the necessity for rejecting and returning a considerable part of a rush order which does not come up to the mark. One road in the United States has met this situation quite successfully by taking the whole onus of testing the rails off the railmaker and placing this responsibility upon its own shoulders. A traveling testing plant has equipment in a standard passenger coach, and this runs about the lines from place to place, dropping in upon the various railmakers and testing their raw materials and finished product on the spot. The testing plant comprises a very complete chemical outfit, as well as standard apparatus for physical tests of metals. This rolling laboratory really protects the steel company quite as much as it does the railroad, by insuring the former against using up its valuable labor on rails that will be rejected by the buyer.

Railway Cars Mount Grain-unloading Equipment.

Because of the necessity, during the war, of unloading ships at whatever ports they might enter, a novel, portable, pneumatic grain-unloading equipment was developed in the United States, and placed in use shortly before the conclusion of fighting. Its principle is quite familiar, but its arrangement is quite another thing. The plant is mounted on two typical railroad cars, and is designed to be despatched from point to point by rail, as needed. Its purpose is to facilitate the unloading of grain at ports that lack suitable facilities, especially those in Europe. The grain is sucked from the ship through an adjustable nozzle into the transport line, which consists of 12-foot lengths of pipe joined together by special couplings. A series of trestles supports the artery between the cars and the edge of the dock, while at different points it is fitted with ball joints to permit changes in position and alignment.

One of the cars is known as the filter truck. It mounts the receiving chamber, into the bottom of which the grain first falls. There the grain enters a discharger, consisting of a bucket wheel rotating within a close fitting casing, and is fed to a chute that drops it on a band conveyor delivering into the hopper of an elevator at one end of the

weighing truck, which weighs and sacks it. Triple filters, consisting of nests of closely-woven canvas tubes, are also mounted on this car. Air, in passing to the blower must traverse these strainers and be freed of all dust and foreign particles. The accumulated dirt is trapped within the tubes, from which it is readily removed for weighing, when this is necessary in order to check the weights given in invoices.

The second car mounts the rotary blower, which is driven by an 85-horse-power motor that also actuates the machinery on the first truck. The maximum capacity of the plant is about 35 tons an hour when conveying from a distance of about 100 feet. The fuel consumption is stated to be seven gallons of gasoline an hour.

Portable Phones for Emergency Use.

For emergency purposes many American telephone companies are adding to their equipment motor vans in which are installed switchboards and other apparatus necessary for a telephone exchange equal to the needs of a city or community of 25,000 people. When a fire or other catastrophe puts a local exchange out of commission, one or more of these trucks is rushed to the scene and telephone service is quickly restored, it being only necessary to connect up with the trunk lines. In cases where fire has destroyed an entire town outfits of this character have been invaluable in putting the distressed community in touch with the outside world. Portable exchanges in use in France are said to have suggested the idea to American telephone engineers.

Electric Water Heater Uses Water as Resistor.

Probably the simplest form of electric heater for use in heating small quantities of water consists of two conducting surfaces placed at a fixed distance from each other in the water, the current then flowing directly through the water from one plate to the other. The water is heated by its own resistance to the passage of the current. This method, it is stated, will not work with distilled water, as practically no current will flow through perfectly pure water. Ordinary drinking water, however, contains enough mineral matter in solution to permit the use of this principle in a heater. A convenient form consists of two brass tubes, one inside of the other, separated by two rubber washers, which have notches or holes made in them, to permit the water to circulate freely between them. One wire is soldered to one end of the inner tube and the other wire to the opposite end of the outer tube.

The heater of ordinary size and dimensions will not take more than a few amperes at 110 volts in ordinary water. It should not, of course, be used with sea water or other water containing such mineral matter, except on a much lower voltage. In any case, care should be taken that the circuit is properly protected by a fuse before the heater is inserted in the vessel of water.

Model Plant for Storing Vegetable Oil.

At San Francisco, in the State of California, special facilities have been provided for handling vegetable oil, which is now being shipped in great quantities from the countries of the Orient for use in a variety of food products, soap, etc. In the year 1918, it is estimated that from 250,000 to 300,000 tons of this material—most of it cocoanut oil—have passed through the Golden Gate into the United States.

One of the new plants for receiving this oil is equipped with a number of immense steel tanks into which the product, after being heated, is pumped direct from the ocean vessels which carried it, and through an 1800-foot pipe line. When practically all the cargo has been forced through the pipe, water is injected to clean it out before the oil hardens. The mixture of oil and water is discharged into a special tank, from

which the water, on settling to the bottom, is drawn off while the oil is transferred to another tank. A special telephone line enables a watcher to notify the ship when the pumping should cease.

In each of the storage tanks are 1,900 feet of steam-pipe coils with which the oil is heated to a fluid consistency, preparatory to pumping it into tank cars for transcontinental shipment. The warmest oil is pumped into a 4-inch main, from which it flows by gravity into the cars, as many as fifteen being filled at one time. These cars resemble those used to carry petroleum.

Wireless Under Ground and Water.

It is conceded that the greatest invention the war has brought forth is the wonderful new system for telegraphing under water and under ground. It will be known as the Rogers system, discovered by James H. Rogers, of the state of Maryland, and kept secret by the United States Navy department while the war lasted.

The new system so far is employed only for receiving. Radio messages sent out from powerful stations in Europe are now being read at underground receiving stations in the United States, and, in some cases, better than when caught by the elaborate and expensive air stations.

In addition, submarines under water are intercepting radio signals sent from shore, and, with crude apparatus, the scientist has succeeded in transmitting signals two miles from a submerged wire.

The theory most generally held, until Rogers demonstrated the correctness of his views, was that impulses hurled into the air from a radio transmitting station and deflected earthward became dissipated, as does lightning, when they struck the ground or water. The Maryland scientist, however, believed that the impulses flowed through the earth as through the air, and that it was only necessary to trap and measure them in the ground.

He had been at work on this theory for a long time before the United States entered the war, and interested naval experts. He offered the results of his work to the navy without price or restriction, and when they were accepted, after conclusive demonstrations, he was with much difficulty persuaded to accept even remuneration for the actual time given to co-operation with the government. One of the first steps taken was the request of the Nevy Department, under war legislation, that the applications for patents be expedited. This, of course, was done.

Some of the main advantages of the Rogers system, so far as it has been developed, according to the experts, are almost negligible cost of construction, the intensifying of signals by pointing the sending apparatus towards the receiving station, and reduction of static interference. Because of the latter advantage the navy's receiving station at New Orleans, where communication with ships in southern waters swept by frequent electrical storms is maintained, uses the underground apparatus with very remarkable success.

In war, a great advantage is that submarines receive messages while submerged. Heretofore this has been done by wires trailing in the water.

The Rogers developments aroused electrical experts of the Government to new efforts to expand and improve the radio transmission facilities. Out of the experimental work done with this and other ideas steady advance has been made under war pressure, and Rogers's theories are interwoven with those of other men in the results that are being obtained.

ALFRED T. MARKS.

NOTES.

The death of Sir Roper Lethbridge removes from our list of contributors a prominent name. From the time this *Journal* was started, he was one of its literary supporters. He was, besides, a warm well-wisher of the *Journal*. He was the author of *India and the Imperial Preference* and the *Indian Offer of Imperial Preference*.

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Mr. Findlay Shirras' report reviewing India's trade in 1917-18 (of which we publish a summary elsewhere in this issue) roughly points out the future development and the lines on which progress in trade is likely to take. The report says:—Three years ago few of us dreamt that India being far distant from the titanic struggle in Europe would have experienced the great changes that have taken place in the commerce and industry in Europe. In commerce continuous demands on the part of the Allies stimulated the export of commodities of vital or national importance and at the same time altered the direction of trade in industry. Necessity was the mother of invention and the war has been a great impetus to industrial development. War time prosperity has so far as our industrial activities are concerned, continued to bring grit to the mill trade. The returns of the year are surprisingly good considering the restrictions prevailing upon exports and the difficulties of freight and finance. Further on Mr. Shirras says:—In the direction of India's trade the effect of the war has been to increase the trade of India with the other parts of the British Empire. The most interesting feature in regard to the direction of trade is a large increase in the trade with Japan and the United States. When the long list of imports at the present time is examined the progress in our trade with Japan cannot be termed other than phenomenal. In 1917-18, the total trade with Japan exceeded that with other countries except the United Kindom and was valued at Rs. 52 crores. That was an increase of 400 per cent in imports and 103 per cent in exports over the pre-war average. The value of trade with the United States had grown to twice what it was in the pre-war period, being second only to that with Japan. Half of the import trade with the United States was made up of iron, steel and mineral oil, while the trade with Japan was chiefly in the import of cotton manufactures, matches, metals, silk manufactures and glass-ware and in the export of raw cotton.

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Speaking at the inaugural meeting of the Chamber of Horticulture at the Caxton Hall, Westminster, on 2nd December, the Right Hon'ble R. E. Prothero, President of the Board of Agriculture, said it was not the big man, but the small men who could not help themselves who were going to benefit by such a chamber. There were three special points to which he thought they might give their attention. (1) The first was the question of Horticultural Research. The History of the World and of the War had shown that, though we were bad starters, we were good finishers. We had undoubtedly lagged behind other nations in scientific research in fruit growing, but the Board of Agriculture hoped that the endowment for research would be increased and developed. If this were so, he did not doubt that research work would be carried to such a pitch as would be a pattern to the whole world. (2) one of the objects of their Chamber would be *the eradication and control of pests* which had hitherto done enormous damage. (3) Then there was the question of *Railway Transport*. They must unitedly put forth effort and show a good cause for the increase of transport facilities and alteration of rates.

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The Government of Mysore in passing orders on Mr. A. Chatterton's note on

Cultivation of Sisal Hemp in the State are pleased to direct that the following concessions be granted for encouraging the cultivation of Sisal Hemp in the State:—Free grant of land (unassessed kharab land by preference) to be made available either to individuals or village communities applying for the same up to an extent of 200 acres in each case under the following conditions:—(a) The land to be free of assessment for five years and then assessed at progressive rates leading to full assessment from the eleventh year. (b) The land to be planted up in full in five years. (c) The land to be liable to be resumed if it is used for any other purpose within twenty years of the grant. (d) Wherever there are not less than 1,000 acres under Sisal Hemp, Government will be prepared to help the cultivators to purchase the necessary machinery for extracting the fiber by advancing half the cost as a loan at a low rate of interest or arrange for the extraction of the fibre purchasing the leaves produced at a rate fixed so as to allow a fair margin of profit to the cultivators. These concessions will be in force for the present until about 5,000 acres are brought under cultivation, preference being given to subjects of the State in the grant of the land. A sum of Rs. 5,000 may be spent on nurseries to be started by the Forest Department as proposed by Mr. A. Chatterton as soon as the concessions are notified and a sufficient number of applications for land is received; the cost being met by reappropriation in the current year's budget of the Forest Department. 3. The Revenue Commissioner and the Conservator of Forests have been requested to take all further action in the matter in consultation with Mr. A. Chatterton and submit reports of progress made from time to time.

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Government in their review of the Report on the working of Agricultural Banks in Mysore state that the two working banks at Palahalli and Hongenahalli paid up in full their dues to Government during the year and carried on transactions on a small scale with their accumulated surplus. The two banks at Churchugundi and Mallapura were wound up and their surpluses were utilised for objects of local public utility with the approval of Government. The work of collection of the arrears due to Government by the defunct banks still continues to be unsatisfactory. The arrears are heavy in the Bangalore and Mysore districts. The Registrar of Co-operative Societies is requested to arrange through the Revenue Commissioner for the issue of instructions to the local Revenue Officers to take more prompt and effective steps to ensure that the arrears are finally adjusted during the course of the current year. A scheme for establishing a land bank in the State has, it would appear, been received from the Agricultural Committee and details are being examined. The Registrar's proposals on the subject of the revival of Agricultural Banks, which he thinks may serve as a useful means of organizing agricultural finance under certain conditions, are awaited by Government.

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It is notified for general information that the British Board of Trade are now prepared to license the import of limited number of carpets into the United Kingdom. Before effecting shipment exporters would be well advised to make certain that the requisite import license has been obtained.

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In view of certain misapprehensions which appear to be entertained as to the exact effect of the recent action taken in regard to the manufacture of standard cloth, the Government of India consider it desirable again to draw attention to the fact that standard cloth is only meant for sale to the poorest classes for the relief of distress and that they have no intention of interfering with legitimate trade or of attempting to supply cloth for general consumption.

In view of the changed position in the region hitherto known as German East Africa, special attention is being given by British manufacturers and merchants to the industrial possibilities of that colony. In particular, the president of the Silk Association has directed attention to the wild silk of the anaphe silkworm, and has suggested that when German East Africa changes hands this raw silk will afford a good opportunity for British silk manufacturers. The anaphe silkworm occurs, as a matter of fact, in many parts of East, West, and South Africa, also in some parts of lower Syria and Southern Persia, where, in the latter regions, the natives, by a simple process in which a home-made mechanical device is employed, produce silk which compares favourably with the ordinary silk. Samples of the silk from Uganda were examined some years ago at the Imperial Institute, which introduced the product to the notice of leading silk manufacturers in this country. It is generally admitted that a new and cheap raw material for the spun silk industry would be of great importance, and it is to be hoped that energy and capital will be forthcoming for the development of this industry in Uganda, whence a certain amount of the silk is already being exported, and also in other British African colonies and certain regions in the Middle East. We believe that specimens of Uganda raw silk and of yarns and fabrics manufactured from it can be seen in the public exhibition galleries of the Imperial Institute.

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In a recent number of the *Bulletin of the Imperial Institute* a former Governor of Burma—Sir Harvey Adamson, K.C.S.I., gave an account of this interesting but somewhat neglected dependency of the Empire. In the current number of the Bulletin (London: John Murray, 2s. 6d.) Mr. A. S. Judge, lately Chief Collector of Customs, Burma, completes the story of the great and still largely undeveloped resources of this territory, in an article entitled "The Development of the Trade of Burma." Burma is of importance not only as an actual and potential source of supply of many industrial raw materials, but also as a market for British-made goods and Mr. Judge points out that the total trade of the country already amounts to about £3 13s 4d per head of the population, which puts it almost on a level with Spain and Portugal, countries with a trade of £4 0s. 0d and £4 3s 0d per head of the population respectively. Burma is the world's largest producer of rice and occupies an important position as an exporter of timber, especially teak, oil-seeds, grain and pulse, cotton, tobacco, rubber, hides and skins. With regard to minerals the most important product of Burma is petroleum, the exports of which have risen in value from £1,500,000 in 1903-04 to nearly £4,500,000 in 1916-17. On all these and other subjects much information is given in this article and attention is also directed to the nature of the chief imports into Burma and there are many useful hints to the British manufacturer, which are the outcome of Mr. Judge's long residence in the country and the special facilities he enjoyed for acquiring a knowledge of its trade. The same number of the *Bulletin* contains an important article on "The Future of the Trade in Cinchona Bark." Everyone is familiar with the story of the introduction of cinchona trees from South America into India and Ceylon and the development of a large export trade in cinchona bark from these British territories to Europe, a trade that also benefited London, which in those days was the world's cinchona market. Only those in the trade know however that India and Ceylon have long ceased to take anything but a very minor part in the production of cinchona bark, of which Java and therefore Holland has now a virtual monopoly, whilst Amsterdam has supplanted London as a market. The matter is of importance because quinine, which can only be got from cinchona bark,

is the recognised remedy for malaria, and with its vast expanses of tropical territory the British Empire is probably the largest consumer of quinine in the world. The *Bulletin* article supplies a full statement of the position of the trade in cinchona bark and quinine and clearly demonstrates the predominant position occupied by Holland and Java. The Germans were apparently making efforts to grow their own cinchona bark before the war, and there is appended to this article a report by the Institute on bark grown in the conquered German territory in East Africa, as well as a report on bark from St. Halena, which proved to be of good quality but of course is not available in large quantity. The *Bulletin* also contains Sir Walter Egerton's paper on "British Guiana and the Problem of its Development" and a note by Mr. G. C. Dudgeon dealing with the results of recent Egyptian researches on the Pink Boll Worm Pest of Cotton. Accounts are also given of some of the investigations recently carried out in the Institute laboratories on new paper-making materials, chiefly from the tropical colonies, on the improvement of certain types of edible beans, and on myrtle wax from South America.

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In order to maintain adequate supplies of foodstuffs in India during the coming months, the Government of India find it necessary to continue to exercise a certain degree of control over shipping in Indian waters. Hitherto this control has been exercised in respect of British vessels by arrangement with the Ministry of Shipping and in respect of foreign vessels by virtue of powers conferred on the Government of India by Rule 14-A of the Defence of India Rules. On the termination of the Liner Requisition scheme, the Ministry of Shipping are retaining power of licensing and direction of vessels registered at ports in the United Kingdom, and it is necessary that similar powers should be exercised in respect of vessels registered in Indian ports. The powers conferred by Rule 14-A of the Defence of India Rules have, therefore, by notification in the Gazette of India, been extended to include the licensing and direction of all vessels not registered at ports in the United Kingdom and owners of such vessels are required to obtain licenses from the Agent to the Shipping Controller in Bombay before proceeding to sea, and to submit such licenses to the Collectors of Customs at the various ports at the time of applying for port clearance.

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From the *Zeitschrift fur Untersuchung der Nahrungs-und Genussmittel* of Munster we learn that the present day coffee substitutes containing as much as 50 per cent of lupins are being used in Germany. The infusion made from those substitutes has an exceedingly bitter flavour, difficult to improve by the addition of sugar or milk. This proves that the toxic substance contaiued in the lupins has not been removed. Roasting is not sufficient to eliminate this substance, although some workers maintain it is, and recent investigations show that lupins, if inefficiently treated and consumed, as in these substitutes, can cause illness, and must be considered as unfit for human consumption. For this reason the measures already taken in Austria to prohibit the use of lupins as a food should be adopted everywhere unless there is sufficient guarantee that the requisite preliminary treatment has been carried out. From experiments made in Holland, this is a somewhat lengthy operation. The lupins require to be soaked for 24 hours, then in fresh water boiled for 3 hours and left to cool for a further 12, then again soaked in fresh water for 12 hours, and crushed up by means of a wooden mallet, when they should be safe to be given to cattle, but are not of very great food value and should be mixed with oat straw. Of such a mixture, about three pounds per day should suffice for working oxen.

A Tractor, capable of drawing a plough through Coffee or Tea fields, may, owing to the closeness of the rows, seem a difficult thing to design, but a Frenchman has invented a machine, called the Jean Bache Vineyard Tractor, for use in the vineyards of France, which might be adopted for use on estates, in young clearings where the lie of the land permitted. In the vineyards of France the lines of vines are planted 59 to 79 inches apart, say 5 feet to 6½ feet. The Tractor Machine is mounted on three wheels, of which two, the front wheel and the driving wheel, pass down the centre of the line which is to be turned over by the plough, a triangular arrangement carrying five Shares. The third wheel, which is chiefly for purpose of balance, runs in the adjacent line, the axle joining this "outrider" wheel to the main machine being elbowed, so as to form a sort of bridge over the vines, and is at least 59 inches high, so as to pass without harming them. In one design there are two of these balance wheels, one on each side of the machine, so as to provide further transverse stability to the tractor.

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GLEANINGS.

The search made necessary in Germany by the war for a substitute for cotton has revealed possibilities which may be made actual in the near future. The common stinging-nettle is likely to become an important factor in agriculture and in the development of the textile industry. Among the many fibrous plants experimented with, the nettle alone has fulfilled all the conditions of a satisfactory source of textile fibre. Investigations and practical tests, made in 1916 at Brunn and Reichenberg, confirm the hopes raised concerning the possibilities to be realised in nettle fibre. There exists now in Germany, according to the *Technische Blatter*, a "Nettle Cultivation Company." The price of 10 Marks per 100 kilograms of air-dried nettle stalks, which can, it is said, be paid, ensures sufficient gain to the growers, while the cost of preparation is not high. In 1915, 1·3 million kilograms of this material were collected in Germany, a quantity which increased to 2·7 million kilograms in 1916; and this without any attempt at systematic cultivation. Thus the capabilities of the plant have been thoroughly tested. From the standpoint of the factory it is affirmed that goods woven from this fibre are, for most uses, equal to cotton goods. Hence for middle Europe at least a large and increasing use of nettle fibre seems assured

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Some months ago it was officially stated in the House of Commons that subsidies are granted to manufacturers of iron and steel to compensate for the increased cost of production. Replying to a question on the subject on November 7th. Mr. Kellaway (Minister of Munitions) said that it would be impossible, within the limits of parliamentary answer, to give the scales of the subsidies, but it was estimated in July last that grants amounting to £ 47,000,000 had been

approved. Recently increase had had to be given, owing to further rise in the cost of coal and rates of wages. The Government is practically the only buyer, being the purchaser of 98 per cent of the output. He added: " A Committee is now sitting with a view to seeing how the arrangement can come to an end in the event of the cessation of the hostilities."

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The establishment of a paper industry in the Transvaal, says *United Empire*, is now an accomplished fact. It has been decided to start with the production of cardboard only, for which there is a big demand in the Union; but, as the industry progresses, the manufacture of brown paper, brown boards, and many other cognate commodities will be undertaken. The plant, which is of an extensive character, is being manufactured locally. Waste paper, rags, sacking, and twine will be used as raw material at first, but as time goes on it is intended to include a greater proportion of natural products—such as fibre, spent wattle-bark, etc. The enterprise is all the more interesting in view of the fact that it is probably the first real attempt in the Union to produce this article on a commercial scale.

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Professor Raitt, consulting cellulose expert to the Government of India, takes a very optimistic view as to the development of paper pulp manufacture in India. In a recent lecture, after pointing out that the world's annual consumption of paper was ten million tons and that the demand was growing at the rate of 25 per cent every ten years, he expressed the opinion that India could do a very great deal to fill the gap. Bamboo and some Savannah grasses, he said, could be used to produce twenty million tons annually for India, Burma, and Ceylon, so that the country could produce pulp for the whole world.

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It is reported that the Government of Ceylon intends to take steps to promote the manufacture of salt in the Island on a much larger scale in the future. This news is very welcome, because the salt industry there is generally recognised as affording scope for considerable expansion, and its development would not only add to the Island's wealth but would also enlarge the sources of revenue, a factor which is of special importance at the present time.

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The Capital of North Ireland Paper Mill Co., Ltd., has now been increased from £100,000 to £200,000. It is intended that the £5 shares be divided into £1 shares and for every such five shares three £1 bonus shares be issued. To meet the additional £60,000 necessary it is proposed to appropriate £60,000 of the credit balance on the P and L Account.

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Mr. G. B. Barham, in the *Liverpool Daily Post* says that the oilskins used in German Navy are of paper chemically treated and impregnated with oil and pitch, and the paper-lines clothing has been served out to men in the German Air Service. He says that these garments stand fairly hard usage.

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It is not at all unlikely that the Australian Government will devote some capital, probably a quarter of a million sterling, to furthering the interests of paper making industry in that country.

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Messrs. Marshall, Sons and Co. is under conversion into a limited company with a factory near Calcutta for manufacturing tea machinery. Capital, 40 lakhs; 2½ lakhs over subscribed.

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The Gazette of India for the 22nd February 1919, contains detailed information regarding further relaxations of the export restrictions in the United Kingdom.

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The import of old newspapers in bulk except from certain European destinations is now permitted. Full particulars can be obtained from the various Custom Houses.

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A new saw-mills company has been floated in Calcutta (capital 250,000 rupees). Managing agents, Messrs. Linton, Molesworth and Co.

SPEECHES AND PRONOUNCEMENTS.

INDIAN AGRICULTURAL SITUATION.

Speech by Sir Claude Hill.

At the meeting of the Imperial Legislative Council held on Feb. 19, Sir Claude Hill laid the following statement on the table :—

'As desired by His Excellency the Viceroy I take this opportunity to make a comprehensive statement regarding the agricultural position resulting from the wide-spread failure of the last monsoon and the economic situation in regard to food-stuffs ensuing from it. I will also explain the action we have taken in respect of our food-stuffs, but in order that the Council may be able fully to appreciate the reasons for that action and its variations I shall have to go back to a period anterior to the last monsoon.

'It will be within the recollection of this Council that, as explained in 1916 and 1917, the Government of India undertook to co-operate in a scheme for the export to Great Britain and her Allies of the wheat required by them and that export of wheat for other purposes and destinations was brought under strict control. Later, in connection with the great pressure upon rolling stock on Indian railways resulting from the shortage of sea freight, it became necessary in April of last year to appoint directors of civil supplies who were empowered to grant certificates in respect of articles required on civil account which gave priority for those articles over ordinary uncertificated traffic. Food-stuffs were, during last summer, dealt with by the directors of civil supplies under this system. When it became apparent during July last that there was reason to apprehend an unfavourable agricultural season the food-stuff board, which had come into being as a result of the Delhi Conference, advised and the Government approved the advice, that a meeting should be convened at Nagpur of all directors of civil supplies and of the railway authorities chiefly concerned

TO CONSIDER THE SITUATION

and to concert measures of a precautionary character. As a result of that conference, improvements were effected in the system of priority certificates and a better understanding was reached between different provinces and the railway authorities as to the methods by which railway traffic in food-stuffs should be regulated. Though the latter end of August saw a partial improvement in the *kharif* situation in parts of India the hopes then engendered were disappointed. September and October were unusually rainless and it became obvious that we must prepare for a severe restriction in the output of *kharif* crops over a very wide area. Accordingly we telegraphed on October 2 to the Secretary of State describing the situation and intimating the inability of India to continue the purchase and export of wheat and other food-stuffs other than those required for Mesopotamia. We further decided that the situation was so serious that it required to meet it, a revision of

OUR ORGANIZATION.

We substituted an executive officer, the food-stuffs commissioner, for the advisory board which had till then helped us. Prompt action, capacity to confer direct with provincial authorities on the spot and defined authority were considered essential in substitution for consultation and advisory powers. The central transport and food-stuffs board had helped the Government admirably during the period when events were maturing, and I take this opportunity to express on behalf of the Government of India our acknowledgment of the services so spontaneously given by the official members of that board.

At the conference convened on October 15 in Delhi, at which the newly appointed food-stuffs commissioner was present, the whole situation was revised and discussed in the light of the agricultural situation as it had developed, and, having regard to the measures already taken in co-operation with His Majesty's Government for the restriction of exports. It will be remembered that on October 15 the war was still in progress and the action then determined on had to be limited with due regard to that dominent factor but the dramatic collapse of Germany resulting in the Armistice still further

FREED THE HANDS

of the Government of India in respect of external obligations and I will now describe the steps taken in November and December to

CONSERVE THE FOOD RESERVE

of India. On our representation to the Secretary of State, His Majesty's Government not only agreed to

our maintaining our prohibition against exports of wheat to all destinations, but, as regards rice, they also acceded to a scheme which we proposed to them, under which the exportable surplus of the Burma crops of 1919 should be utilized primarily for the needs of India and of certain countries which contain Indian population and are dependent on this country for their supplies of rice. Practically, then, it may be said that those western and many eastern markets which have, in the past, been regularly drawing on India, have now turned elsewhere for their supplies of rice and wheat. Again, early in December, when the brief review of the position indicated the necessity of assuring an additional supply of wheat, we proposed through the Secretary of State to the Home Government programme of

PURCHASES FROM AUSTRALIA

to tide over the period until the *rabi* was harvested. I am glad to say that through the good offices of His Majesty's Government, we have secured this wheat and freight for us at cost price. We have been able to make some progress with this programme, and actually we have purchased, and there are or will shortly be on their way to us 125,000 tons of Australian wheat. The original programme, which contemplated an import of 200,000 tons we have now still further extended, and provided that shipping can be made available, we trust that it may be possible for His Majesty's Government to obtain for us in Australia 500,000 tons to reach India before the end of July. In regard to the Burma rice crop we have taken still further steps. Not only have the exports from Burma been restricted to certain destinations, as I have explained, but even these limited exports are to be subject to a price control, for no export license is being granted expect on satisfactory evidence being produced, to the effect that the price paid does not exceed the maximum controlled price. Finally, we have secured two substantial reductions in the freight on rice from Rangoon. The first resulted in a cheapening of the price of this commodity in Bombay by a rupee a bag and in Madras by 12 annas, while the second, which has brought down the freight rate to Bombay to Rs. 30, will ensure a further reduction of a rupee per bag in the place of this necessary article. These measures have been supplemented by prohibitory orders against the exportation of other food grains. A position has thus been reached at which

NO FOOD GRAINS WILL LEAVE INDIA

except in very limited quantities and for exceptionally strong reasons. In such circumstances, we felt we were able to contemplate a relaxation of the restrictions which had been placed on the movement of food-stuffs within India. The imposition of these to the time when as will hav been understood from my earlier remarks in order to facilitate the purchases for the Royal Commission and, at the same time, to protect the Indian consumer against an undue inflation of prices, it was found necessary to prohibit the movements of wheat from the Punjab, but the main cause which led to the regulation of the traffic in food-stuffs was, as His Excellency the Viceroy explained in this Council last September the congestion on the railways which, owing to the enormous quantity of military material and the large number of troops which had to be transferred, formed a very serious difficulty in providing facilities for the movement of the commodities essentially required by the civil population. Directors of civil supplies were then created, whose certification of any particular traffic to was, as I have explained, to be accepted by the railway authorities as entitling such traffic to priority. Subsequently, it was found that the holders of these priority certificates were, in certain parts of India, thereby placed in a favourable position and were taking advantage of this to raise prices against the consumer, and we were approached by almost all the local Governments who asked that they should be empowered to

REGULATE THE MOVEMENT

into from and within their provinces. At the time this demand manifested itself we felt very grave doubts as to the desirability of acceding to it, for we anticipated as has indeed come about that the discretionary power so granted to local authorities would result in certain areas finding themselves cut off from purchasing their essential requirement, those parts of the country to which they had ordinarily in the past looked for their supplies. The opinion of the local Government, was however, so strong and insistent that we decided to defer to it, at any rate until some experience had been gained of the way in which these powers would be used. At the same time, we withdraw from the scope of the local Government's control two essential commodities, rice and wheat which, we decided must be kept in our own hands, and in regard to which, while we hear the news of the local government as to the capacity of their provinces to supply, we recognised that it must be left to us definitely to decide to what extent each supplying province should contribute its quota. More recently, we have added gram to the list of commodities the movement of which we ourselves regulate. Towards the end of the last month, as a result of the protests which we received from the Government of Bombay against the results of the policy of entrusting to local authorities.

THE RIGHT OF DIRECTING MOVEMENTS.

From their provinces, we have withdrawn this power from all local governments. The protest from the Bombay Government, to which I have referred, laid stress on the very great difference between the prices in Bombay and those prevailing in upcountry centres. It is indeed only a natural result of the obstacles which have been placed by the system of regulation in the way of free movement of food-stuffs. That there should be, in different parts of the country, abnormal variations in the price of food-stuffs in itself was a grave wrong but other disadvantages followed from this attempt to run counter to economic laws. Trade was hampered, the fullest use was not made of long esta-

the setting up of new trade connections should be attended with difficulty and delay. I can only make a brief allusion to

THE SUBJECT OF PRICES.

These have reached an abnormally high level, and we fully realise the hardships that they entail on the great mass of the population but during the period following such a world-wide cataclysm as we have been through during the last four years it is idle to expect that conditions should return at once to the normal. The effect of the diversion of human effort from the labours of peace to the work of war is bound to continue to make itself felt for some-time to come. To a large extent India has been saved from many of the consequences which other belligerent countries have had to undergo, and it is only, in the last few months, that we have seen prices here begin to move towards the level which obtains in the outside world. And even now, in many cases, Indian prices are still much below the world prices. It has been argued, in some quarters, that the present level of Indian prices indicated a shortage of supplies. This is not necessarily the case, for we have seen that the rise in prices is not limited to any specific commodity or group of commodities but is practically universal and for the universality of a raise in prices we must probably look to some cause of general application. The whole subject is an intricate one and would need more elaborate discussion than I can give to it here. As regards

THE PALLIATIVE AND RELIEF MEASURES

Regarding which questions have been asked in the Council, large allotments have been made for taccavi loans, a measure of relief which proved to be of the greatest benefit in the famine in the United Provinces in 1913-14. The programmes of public works are being expended, where necessary, to provide labour and earthwork is being started on some projected railway. Direct measures of relief are only in the initial stages, such as the opening of poor houses, on a small scale, for the distribution of gratuitous relief. It has hitherto been an accepted principle, embodied in the famine codes that gratuitous relief should not be given before scarcity has been declared but we have found it necessary to relax the principle in some cases where the economic distress has been aggravated by the epidemic of influenza. One bright feature illumines the otherwise sombre retrospect of the past season. The monsoon was slightly more active in November and December in Madras and the Central Provinces especially, while the rain of three weeks ago all over the country except Bombay had been of incalculable benefit to the standing *rabi* of Upper and Central India. We can now hope to reap a *rabi* crop sufficient, and the imports of Burma rice with Australian wheat to carry us through the ensuing months, and though the position is not free from anxiety, an anxiety largely occasioned by the degree to which the world at large is hampered by shortage of shipping freight. I think we may hope successfully to tide over the period intervening between now and the next monsoon harvest. I should like to pay my tribute to what His Excellency said in regard to Mr. Gubbay's work. Without his resourcefulness and devoted industry, we should have found it hard at times to carry on and the general public as well as the Government owe him a warm debt of gratitude.

TOPICS FROM ECONOMIC PERIODICALS.

INDUSTRIES AND COMMERCE.

Possibilities of Glass Manufacture in Burma.

Mr. A. P. Morris, Principal, Government Engineering School, Indian and Provincial Art Officer, Burma, has written a useful Note on the possibilities of glass manufacture in Burma. We publish the text of the note. In forwarding the note to the local government, Mr. Morris remarks:—

"I do not think my experiments can be carried much beyond this point without further expenditure. The next step would be to design a glass furnace fired by paddy husk and to engage an expert to deal with the manufacture of glass articles. Naturally I should like to do this, but I hardly think it is necessary. The industry is not a village industry but one which will require capital and I think the best thing would be to make this information public and see if any of the larger firms in Rangoon can be induced to take the matter up. I think a comparatively small expenditure would satisfy any firm of the feasibility of manufacturing glass at very small cost, particularly if the firm owned a paddy mill and put up its glass factory next door. The conversion of the glass into useful articles would need expert supervision but there is plenty of reason to think that local labour could be trained to glass blowing and other processes.

The production of glass has so far not been attempted in Burma. One reason has been the lack of a supply of sufficiently pure silica. This indeed has been a factor in the failure, until very lately, of any attempts to produce good glass on a commercial scale all over India, though recently suitable supplies have apparently been found in Madras. Quartz sand there is in quantity, but always with such an amount of iron in it as has rendered the production of anything but dark green bottle glass impossible. A very small quantity of iron colouration can be corrected with Manganese? but this is only possible if the percentage of iron is very low.

As a source of a particularly pure form of silica it seemed to me that paddy husk might be useful. Experiments show that the ash is mostly silica and that the husk gives about 18 per cent of white ash. Using this as the source for my supplies of silica I have, with the help of Mr. Nicholas, Science Lecturer at the Engineering School, conducted a few experiments. The husk used was not cleaned and the small amount of iron indicated by the tests was probably most of it due to the clay present in the dirty

husk, even so the silica yielded a glass of a light green or yellow colour, the deepest shade not being deeper than the colour of a good peridot. By the use of manganese dioxide a colourless glass can be prepared, and I have managed to produce in the laboratory a colourless lime-soda glass of fairly high fusibility.

Further, using the paddy husk-fired pottery kiln I have found that the temperature obtainable by the firing of paddy husk is sufficient for the manufacture of glass. The kiln was not designed for glass manufacture and the amount of husk required to obtain a given quantity of glass was therefore not calculable. With a furnace designed for the purpose paddy husk firing would be very suitable.

In my early experiments I carried out the glass production in two stages, first producing soda glass and then converting the soda glass into a non-soluble glass. It was also under the impression that we should have to design special apparatus for reducing the husk to white ash as the ash of a paddy furnace is not fully reduced and contains a large amount of unburned carbon.

Subsequent experience with the pottery kiln shews that a large part of the ash can be obtained with only a small percentage of carbon and that this percentage of carbon does not matter. It is possible to take the ash with its carbon and convert it into marketable glass at one firing.

If the husk is washed before reduction the percentage of iron is greatly reduced, but I am not sure that it would not be more economical to use it as it is and add manganese. One would have to experiment on a fairly big scale to determine this point.

According to Mr. Raikes, Deputy Controller of Munitions, there are 250,000 tons of unused paddy husk available yearly in the Rangoon area alone. This quantity was calculated before the rather widespread use of paddy husk as a fuel outside the paddy mills which has developed during the last few months; but the quantity available is still very great. More husk would have to be burned than would be necessary for the production of a given quantity of glass as regards the amount of silica required. The effective colorific value of the husk is about 5,000 calories per pound.

The second ingredient in glass manufacture is sodium carbonate or better still sodimu sulphate and this is also available lacally. In fact if the production can be stimulated on the lines indicated in my note on soap sand there should be no lack of supplies.

Lime of pure quality can also be obtained and manganese is available in Burma or could be imported from India.

The experiments conducted indicate that—

(i) Paddy husk can be used to develop sufficient heat for glass manufacture. Measurements in my kiln gave between 1,100° and 1,200° C.

(ii) Paddy husk yields as a bye-product silica sufficiently pure to be suitable for the manufacture of colourless glass. Further the silica is in a finely divided state which makes its conversion into glass particularly easy.

(iii) The other ingredients for a lime-soda glass are available locally and the glass obtained is of high fusibility and good quality.

(iv) With the husk fuel at such a low price and the silica in a finely divided form as a bye-product the manufacture of glass would be particularly cheap.

THE MADRAS RICE MILL INDUSTRY.

The Department of Industries, Madras, has just issued a Bulletin (No. I—New Series) entitled "The Milling of Rice in the Madras Presidency" by Mr. L. B. Green, Assistant Director of Industries, Madras. The following extract is taken from it:—

In concluding this brief survey of the rice milling industry, it seems desirable to attempt briefly to summarize the position and possibilities of the industry in Madras. The industry which is centred chiefly in the delta districts, Godavari, Kistna, and Tanjore, has made great strides in recent years and is now one of the most important industries in the Presidency. Moreover, unlike the Burmese mills, which are chiefly controlled by the large European export firms, it is the product of Indian enterprize, and is entirely in Indian hands. The lack of interest shown by the European firms in Madras in the development of the industry is probably due to the fact that the rice produced is required mainly for local consumption and that no appreciable surplus appears to be available for export. But from whatever cause the non-participation may be attributed to the industry in Madras has unquestionably suffered from the lack of attention given to it by European rice milling experts. Reference has already been made to the unsatisfactory features of the rice mills in the districts of Godavari and Kistna where the mills are not erected in accordance with any standard plan, and are generally operated under the most inefficient and uneconomical conditions. In Tanjore it has

hardly passed the stage of a rural industry, and in other districts the indigenous system of husking remains in force. In contrast to this state of affairs it may be pointed out that most of the large Burmese mills are controlled by European firms, and have had the assistance of European Engineers in the supply of plans and the provision of plant and machinery adapted to local requirements. The existence of an export trade in Burma has made it essential for efficient mills to be constructed in order to reduce their cost of cleaned rice to a figure that would permit of competition with foreign mills, and in Madras this stimulant is lacking. It is unlikely that Madras will ever rank as a large rice-exporting province unless agricultural improvements result in a considerably increased yield per acre, and speaking generally it is not, therefore, necessary to produce such highly finished rice as that produced by some of the Burmese mills for export. But the fact of the export trade being of relatively small proportion in Madras, is an insufficient reason for the construction of inefficient and inadequately organized mills, as in these mills the cost of production of finished rice must necessarily be high. If well-designed mills were constructed in the various rice growing districts under skilled supervision the result of adopting improved methods of milling would be production of superior finished products at a lower cost. It is greatly to be hoped, therefore, that after the war the crude mills of the Kistna and Godavari districts will gradually give place to modern milling plants installed under skilled supervision, and that in the Tanjore district, the small single huller oil engine driven plants will give way in some cases to modern large scale mills, and in other to the smaller self-contained plants on the Rangoon system which have been referred to elsewhere in this bulletin. The result of such a development would be that the chief products (rice and bran) would be considerably improved in quality and that the lower cost of production consequent on the introduction of the modern system of milling would enable the price of rice to the consumer to be lowered. Also if the numerous isolated small milling plants of the Tanjore District were combined into a number of properly organized commercial factories (which need not necessarily be large), there is no reason why a considerably larger share of the Ceylon rice trade should not fall to this District in seasons when a surplus is available for export. At present Tanjore is in a very strong position owing to the lack of steamers for the shipment to Colombo and the West Coast of Madras from Rangoon of the usual supplies of rice for the Ceylon and Malabar markets. But unless modern methods are introduced into Tanjore, and the cost of production reduced this trade will eventually revert to Burma as soon as there is a resumption of normal conditions. As regards the districts in which the indigenous system of husking still flourishes, it is to be hoped that properly organized factories will evolve direct from the hand husking stage without the introduction of the small single huller mill as an intermediate stage of development. The installation of the latter type of mill should be confined to isolated towns or villages where the production is required for the needs of the local population, and where the demand is too small or the supply of raw material available is insufficient to keep a large mill on the Rangoon system working at full capacity, but in these cases shellers should invariably be installed. It is very desirable that husking and milling of rice by machinery should be introduced in the place of the primitive indigenous system of husking in districts where up to the present it has not taken root, for a large quantity of manual labour is being devoted unprofitably to the indigenous system, labour which as the home industries of Southern India are developed should be able to find more lucrative employment in other lines of manufacturing activity, for not only does it give a poor return to the producer, but has the effect of maintaining at a high level the price of rice for the consumer, which would be reduced in these backward districts by the introduction of the modern system of rice milling.

EXPANSION OF COTTON SPINNING IN JAPAN.

H. M. Commercial Counsellor at Yokohama writes to the *Board of Trade Journal* :—

The Spinners' Union of Japan have given the number of spindles in course of installation in October last as 95, 644 for coarse-sized yarn, 172, 112 for medium-sized yarns, and as 133, 098 for fine-sized yarns.

The comparatively large number of medium and fine-sized yarn spindles is due to the fact that it is far more lucrative to produce the medium and fine sized than the coarse sizes, and the spinning industry of Japan is tending to develop more in the manufacture of fine-sized yarns. In addition, the market has been cultivated greatly for Japanese cotton fabrics in China, India, and other Oriental countries in the place of the British products due to the war.

Classified according to their respective mills, the additional spindles are as under:—

SPINDLES TO BE ADDITIONALLY INSTALLED.

Name of Mill.		Coarse-sized. Yarns. No.	Medium-sized. Yarns. No.	Fine-sized. Yarns. No.
Fukushima	...	0	7,680	0
Osaka Hosiery	...	8,400	1,600	0
Matsuoka	...	0	2,895	0
Osaka Orimono	...	0	0	5,720
Idzumi	...	20,672	0	0
Kishiwada	...	4,628	0	0
Wakayama	...	23,800	0	0
Uchimi	...	5,832	0	0
Hinode	...	6,120	0	0
Kurashiki	...	8,128	24,480	0
Saga	...	1,026	0	0
Oita	...	0	21,788	15,600
Oriental	...	15,744	0	95,440
Sagami	...	0	20,400	0
Kanegafuchi	...	314	5,052	16,338
Fuji	...	0	59,840	0
Tokia Calico	...	800	15,200	0
Matsuta	...	5,576	0	0
Japanese-Ghinese	...	0	27,932	0
		95,644	172,112	133,098

REDUCED FREIGHT RATES TO JAVA.

A reduction was made in October in the rates of freight for cotton goods from Japan to Java owing to the large amount of tonnage now available for this service.

Dutch lines at that time continued to quote yen 26 per ton less 5 per cent, but the Osaka Shosen Kaisha reduced their rate, which used to be yen 32, to yen 28 per ton to Surabaya and Samarang, and yen 29 per ton to Batavia. The Nippon Yusen Kaisha, which was previously charging yen 33, reduced its rate to yen 27·50, less 5 per cent. The Nanyo and Taiyo lines do not appear to have reduced their rates, but it is understood that they are prepared to accept lower rates than those officially quoted.

CARRIAGE OF AMERICAN COTTON.

A contract has been entered into between the Japan Cotton Spinners' Association and three leading Japanese steamship companies for the carriage of American raw cotton to Japan during the period 15th October, 1918—30th April, 1919. The latter contract to carry 200,000 bales (the same quantity as as in the previous season). Freight is fixed at yen 2·15 per 100 lb., as compared with yen 1·50 in the 1917-18 contract. Remaining features of the two contracts are practically identical.

DEVELOPMENTS IN SERICULTURE.

An important development in the United States silk industry, if climatic conditions are favourable, was recently announced in the press, says the *Board of Trade Journal*:—

So successful, it is stated, has the Austin Silk Plantation and Manufacturing Company been, that it has just increased its capital stock from 12,500 dols. to 500,000 dols., and changed its principal place of business from Austin to Houston. This company began the culture of silkworms and the production of silk near Austin about three years ago.

It is stated that the company has acquired a tract of more than 300 acres of land near Houston, which it will plant in mulberry trees for the propagation of silkworms. The production of silk and its manufacture on an extensive scale is to be developed as rapidly as possible, according to the promoters of the project. It is announced that the silk farm near Austin will continue to be operated.

It is not stated how much of this capital is devoted to sericulture.

AVAILABLE RESOURCES FOR CELLULOSE PRODUCTION.

British India consumes approximately 75,000 tons of paper and paper goods per annum, and of this, 30,000 tons are supplied from Indian mills. Local production has been stationary for several years, because, according to the Government's cellulose expert, the limit of its present resources of raw material has been reached—and even to maintain the present output 12,000 tons of wood-pulp have been imported from Europe annually, says the *Board of Trade Journal.*

In order to interest financiers in the further development of the industry, the cellulose expert recently addressed an audience at the Indian Museum, Calcutta, on the value of the bamboo and Savannah grasses as a source of cellulose supply. He stated that at a modest estimate there is available under sound manufacturing conditions in Burma, Bengal, and South and West India, enough bamboo to produce 15,000,000 tons of cellulose annually—the world's consumption of paper at present being 10,00,000 tons

per annum. From Assam, also, he stated Savannah grasses can produce a further 5,000,000 tons annually. India could, therefore, produce pulp for the whole world.

Advantages over Spruce or Fir.

To grow a spruce or fir tree to pulp-wood size takes from 40 to 60 years, with the result that a factory which may at its start have its supplies at its back-door finds these year by year recending into the distance with constantly increasing transport costs. Bamboos and grasses come to their full maturity as yearly growths, although it is necessary not to reduce the reproductive vigour of the plant by too frequent cropping. With bamboo this may mean a three to five years' rotation, and with grasses two to three years, according to soil and climate.

The Manufacturing Side.

On the manufacturing side the Forest Research Institute of the Indian Government has succeeded in solving the difficulties which faced it at the beginning of its efforts. The chief of these were two in number: (1) the nodes or knots and their obstinate resistence to penetration by the digestive liquors employed (this has been overcome by the simple operation of totally destroying and opening out their structure by crushing) and (2) the resistence to efficient and economical bleaching. The Institute has at last succeeded in evolving a system of digestion which entirely eliminates this trouble, and pulps can now be produced from the bamboo which are equal to the best wood-pulps in both quality and colour. The Institute is about to embark upon an extensive enlargement of its industrial exploration activities, and these will include a complete modern pulping plant which will enable its laboratory investigations and results to be repeated, expanded, checked, confirmed or corrected on a scale large enough to permit of factory methods being employed.

Manufacturing Costs.

Chemically-produced wood-pulp costs, the cellulose expert stated, on the average pre-war for wood alone and ignoring for the moment all manufacturing costs, £4 10s.; *i. e.*, about Rs. 65 to Rs. 70 per ton of pulp. Bamboo and Savannah grasses, owing to their abundance and the fact that they reproduce themselves annually and that there is no other serious demand for them will, assuming good manfacturing facilities, cost only Rs. 25 per ton of pulp. There is, therefore, at the outset some Rs. 40 in favour of India in this one item alone. In a plant producing 10,000 tons per annum this means an advantage of 4 lakhs over a European competition. Inclusive of water freight to paper mills it will, as far as can be estimated, cost round about Rs. 100 to Rs. 110 per ton delivered to consumer. Its value, pre-war, in comparison with imported wood-pulp, was about Rs. 150. After the war it is making large reservations for safety to call this Rs. 200 per ton, he added. The increased cost of freight alone from Europe will account for nearly the whole of this rise.

DEVELOPMENTS IN CHEMICAL INDUSTRIES.

The following notes on certain developments in the United States Chemical Industries are taken from official announcements and various articles in the American press:—

Potash Developments in Utah.

An account of the potash developments in Utah since 1914, given in the press, attributes the principal sources of potash to the alunite deposits, the waters of the Great Salt Lake, salt beds and marshes, and cement districts.

At the present time the following companies are actually producing:—

The Mineral Products Company, of Marysvale, which is the pioneer in the potash industry in Utah, having commenced operations in 1915. Its new large reduction plant has maintained a steady production since it was started in February, 1918. It uses the Chappel process in working the alunite deposits and is at present turning out about twenty-five tons of sulphate of potash, of 95 per cent purity, daily. Successful experiments have also been made in reducing the aluminium oxide accumulated on the large dump to the metallic state.

The Florence Company is also erecting a mill a mile south-west of Marysvale to treat alunite deposits. It expects to turn out ten tons of sulphate of potash a day, of 95 per cent purity.

The Salt Lake Chemical Company is making from three to four tons of potash daily at Burmester, at the end of the Great Salt Lake, utilising the waters of the lake. It is a subsidiary of the Diamond Match Company, and began producing in January, 1917.

The Utah Chemical Company, with an output of ten tons daily of a lower grade sulphate of potash, is situated three miles east of Saltair. It is a subsidiary of the Southern Cotton Oil Company, and is allied with the Virginia-Carolina Chemical Co., and the Inland Crystal Salt Co., utilising the by-product of the last company and producing a low-grade potash entirely used as a fertiliser.

The Portland Cement Company of Utah, and the Ogden Portland Cement Company, have quite recently erected potash recovery plants at the works of the Riverside Portland Cement Company, and are now turning out about a ton and a half each daily of K_2O_2, extracted from the cement by a process which has gradually been improved upon, until now a high-grade product is obtained.

Besides the operations above mentioned, there have been many announcements of discoveries of potash-bearing minerals and waters from various parts of Utah ; for instance, the prospect in Little Lake, near Perowna, the deposits in rock form east of Perowna, Quitchipa Lake, west of Cedar City, and many others. In order, however, to enter the market in competition with foreign producers, soluble potash salts must be obtainable cheaply and in larger quantities.

It is expected that the potash production in Utah during 1919 will reach approximately 55,000 tons; in 1916 the total production in the United States was only 35,739 short tons.

PRODUCTION OF SULPHUR.

An amendment to the charter of the Texas Gulf Sulphur Company, increasing its capital stock from 750,000 dols. to 3,000,000 dols., has just been filed in the office of the Secretary of State in Austin, Texas.

The Texas Gulf Sulphur Company is preparing to develop a very large underground sulphur deposit near Matagorda, Texas, within a few miles of the Gulf of Mexico, and only a short distance from the big sulphur property of the Freeport Sulphur Company.

It has been reported from time to time that the initial plans of the company call for expenditure of approximately 4,000,000 dols. in the installation of batteries of giant boilers and other equipment preparatory to beginning actual mining operations. It has already finished the construction of a six-mile spur track, connecting it with rail-road outlet, and has made considerable progress with its other improvements. By means of test holes it has proved an enormous tonnage of sulphur, it is stated. The mineral product will be brought to the surface in dissolved form by powerful steam pressure.

The output of the Freeport Sulphur Company is the second largest in the United States, being exceeded only by the Union Sulphur Company, of Sulphur, La. It is stated that the Texas Gulf Sulphur Company plans to operate eventually on equally as large a scale as the Freeport Sulphur Company or even the Union Sulphur Company.

FUTURE OF THE DYE INDUSTRY.

Dye manufacturers held a conference with the War Industries Board in November to discuss general conditions in the newly-developed industry, and to discuss plans which might aid in permanently establishing the dye industry in the United States on a more extensive scale than as yet attained.

Proposals were made at the conference that in order to retain the commercial advantages obtained because of the shutting of the flow of European dyestuffs into American markets, all incoming dye shipments from abroad should be imported under a license system.

Further conferences are expected to be held by the Board with representatives of the industry for a more thorough discussion of the situation.

NEW CHEMICAL MANUFACTRUING COMPANIES.

Fourteen companies for the manufacture and distribution of chemicals, drugs and dyes, were organized during November their aggregate authorised capitalisation being 3,170,000 dols. This figure represents an increase as compared with 2,760,000 dols. in October, and, in fact, is the largest total for any month since April of this year. The indicated investments for the first eleven months of 1918 is 66,988,000 dols., which is less than half of the total for the corresponding period of last year.

The aggregate authorised capital of new drug and chemical companies formed during the war period—August, 1914—30th November, 1918—is shown to be 394,795,000 dols.

SUBSTITUTE FOR PLATINUM.

The Chemicals Division of the United States War Industries Board have announced the discovery of a new substance to take the place of platinum in the manufacture of sulphuric acid.

The discovery was made during the latter days of the war. Sulphuric acid is required in the manufacture of high explosives, and a serious stringency was being faced due to the scarcity of platinum and the difficulty of obtaining it, even in small quantities from Russia.

In the manufacture of sulphuric acid, sulphur dioxide (SO_2) is first obtained by burning sulphur pyrites. This sulphur dioxide gas, after being dried, is passed over magnesia containing a small percentage of platinum. In this process the sulphur dioxide takes up an additional atom of oxygen (O) thus forming sulphur trioxide (SO_3). This sulphur trioxide, in turn, is passed through water (H_2O), forming sulphuric acid (H_2SO_4.)

FUNCTION OF THE PLATINUM.

In the above operation the platinum performs the function of a catalyst, in that it quickens the process of converting the sulphur dioxide into sulphur trioxide.

The suggestion which resulted in the discovery of the substitute was made by the Director of the

Chemical Division of the War Industries Board, and President of the Armour Fertilizer Works. It was developed by a Fellow of the Mellen Institute of Industrial Research at Pittsburgh.

COMMERCIAL PLANT ESTABLISHED.

According to the United States "Official Bulletin," not only has the new catalyst been demonstrated as practical in laboratory tests, but a commercial plant has been established which is producing the substance in quantity. It is cheaper than platinum and has been found to be less sensitive to "poisoning." Altogether, the discovery is regarded as a distinct advantage in the art.

The same catalyst has been tried out successfully in a modified Deacon process for making chlorine gas in connection with the manufacture of "mustard gas." By its use it has been found possible to effect a considerable saving in the electrical horse-power required by the process. Ordinarily, for the manufacture of 100 tons of Chlorine, 20,000 horse-power would be required. With the use of the new catalyst the same quantity can be made from 2,000 horse-power.

SUBSTITUTE FOR GLYCERINE.

Another discovery made by the Mellon Institute, working in co-operation with the Chemical Division of the War Industries Board, is a substitute for glycerine for use in chewing tobacco. This was the result of efforts to aid the tobacco industry of the country when it had become necessary for the Government to take over all glycerine supplies for the manufacture of exposives.

Under similar circumstances the Mellon Institute was able to find and develop substitutes for acetic and acetones.

AFTER-WAR EXPORT OF CHEMICALS.

With regard to chemicals, which, due to war stimulation, the United States is now producing in surplus quantities, steps are now being taken by the industry to develop foreign markets, and consideration has been given in the industry to the establishment of co-operative selling agencies under the Webb Act. It is not unlikely that before long, the United States will be exporting in competition with other countries certain chemicals which she has hither to been accussomed to import.

GASOLENE SUBSTITUTE.

The following advantages are claimed in the press for "Liberty Fuel"—a gasolene substitute which has been perfected under the direction of the War Department Research Division. The fuel is stated to have a kerosene base:—

It will start easier than gasolene.
Leaves no residue of carbon, soot, etc.
Explodes at temperatures below zero.
Is capable of greater mileage per gallon than gasolene.
Safe against premature explosion, igniting only from spark or flame.
Its combustion requires less oxygen than gasolene.
Can be manufactured for less money than gasolene.

ECONOMIC NOTES.

AGRIULTURAL.

Ring Disease of Potato.

The Department of Agriculture, Bombay, have issued the following leaflet (No. 8 of 1918) on the ring or Bangadi disease of potato :—

In nearly all the potato growing tracts of the Deccan and the Bombay Karnatak, one of the most important diseases of the potato crop is the ring disease, known to the people as *bangadi* or *chakri*. The present leaflet describes the symptoms of the disease and the methods which should be adopted to prevent attack by it.

Symptoms.—In the fields the disease is easily recognised by the sudden withering of the plants. In the early stages of attack, only a part of the plant withers, but the withering later on extends to the whole plant. Such affected plants turn brown and dry up. In places where the disease is very bad, a considerable number of such dead plants, either scattered or in patches throughout the fields, is a common sight. If the tubers of an infected plant are cut through, some of them at least show a brown ring in the interior at a little distance from the surface. The name of the disease is derived from this character. On squeezing such a cut tuber slimy drops of liquid, creamy yellow in colour, will ooze out from the brown ring. This liquid contains myriads of microbes or bacteria which are the cause of the disease.

Infection.—The disease is chiefly carried into the crop by using such affected tubers for seed. If the seed potato is very badly diseased, it will rot in the ground without sprouting at all. If it is not so badly diseased, it will sprout, but the bacteria will soon spread out into the plant and cause it to wither. From such rotten tubers and plants the bacteria which cause the disease are carried away by irrigation water to healthy plants which are attacked and killed. It is in this way that the disease is spread in the fields, and a large number of plants are destroyed. In other cases, the affected plants may remain alive till the harvest, but the disease reaches the tubers and remains there in a dormant condition. Infection is also likely from the bacteria remaining in the soil, but under ordinary conditions of cultivation the commonest mode of infection is from the use of diseased tubers.

Rotting in storage.—At the time of the harvest the tubers of the diseased plants get mixed with

those of the healthy ones, before they are carried to the store, and consequently a considerable number of tubers rot. The brown ring in the tuber gradually extends first towards the skin, and on reaching the surface the eyes are blackened and killed and such tubers become useless for planting. It then spreads to the interior of the tuber so that the whole of the potato becomes a rotten mass. At such a stage a slimy liquid containing many bacteria, comes out from every eye of the tuber, in which condition the disease is aptly called "Sore eyes" in some places.

Preventive Measures.—The disease being mainly due to the use of infected seed the preventive measures must be directed firstly towards obtaining disease-free seed and secondly towards stopping secondary infection. The following measures will secure this and keep the disease well under control:—

(1) Get seed from places known to be free from the disease.

(2) While cutting the tubers for sets, those that show the ring inside should be discarded and such rejected material should never be left in the fields. Otherwise it becomes a source of secondary infection. It should carefully collected and burnt.

(3) Whenever a diseased (showing ring) tuber is cut, the blade of the knife gets contaminated with the disease and the sets from healthy tubers get infected when cut with the same knife. In order to prevent this the blade should be dipped in boiling water each time an affected tuber is cut.

(4) The fields should be frequently inspected and any affected plants seen should be removed and burnt. It is not sufficient simply to pull out the affected plants. By doing so only the upper part of the plant comes out and the root and tubers remain in the soil, and as already stated, these contain the germs of the disease. The longer they are left in the field the greater is the danger of increasing the infection to other plants. To prevent this the affected plants as soon as detected should be carefully dug out so as to remove all their underground parts.

(5) The places where water stagnates in the fields are generally the most affected. Such places should be avoided or, if possible, be levelled.

(6) The tubers should be stored in a cool well-ventilated place and should be occasionally examined and those showing signs of rot should be removed.

PRICKLY PEAR AS FODDER.

The following revised Leaflet (No. 2 of 1919) has been issued on the Authority, the Director of Agriculture, Bombay; the Superintendent, Civil Veterinary Department; the Collectors of Poona and Ahmednagar; and Rev. A. Norton, Dhond:—

The combined experience at Dhond, at Poona, and in the Ahmednagar and Poona districts leads to the following statement as to the best and safest methods of using Prickly Pear as a food for the maintenance of famine cattle, and as a nucleus in the maintenance of *mhot* cattle.

Value of Prickly Pear as Food.—Prickly pear properly prepared, in the dry weather, is about two-thirds the value of ordinary green *jowari* fodder, and can be used safely in replacement of a corresponding amount of the latter.

Burning of Prickly Pear for use as Fodder.—There are two methods which have proved successful in preparing the fodder. In both cases an intense hot flame is necessary, and one free from smoke. The fruits should be removed before the pear is burned.

(a) *Method with Blow Lamps.*—Cut the pear in branches from two to four feet long. Hang it on stout iron hooks about five feet from the ground on a cross beam of wood, by one of the joints,—leaves downward,—so that the lowest part will be clear of the ground. Begin burning from the lowest leaf. The heat from the lower thorns burning will soon set fire to the thorns above, and the whole branch will flare up. All the thorns will not be burnt up thoroughly in this way, and the whole will have to be gone over with the lamp, working upward, to burn what is not properly burnt. Then it will have to be looked over once more to get rid of any stray thorns which have escaped notice.

This is the best way of burning the Prickly Pear, but lamps are now difficult to get and very expensive, while they are liable to get out of order quickly under village conditions.

(b) *Method of Lohar's Forge.*—An ordinary lohar's forge can be used almost equally well for burning prickly pear. In this case the fire is fixed, and the pear in suitable-sized branches about two feet

long, which should not be too straggling, is held with the lohar's tongs in a sloping position over the flame of a well-blown-up forge. The thorns will catch fire, and those on the upper parts will flare up as when the lamp is used. Then the branch is turned over and the other side burnt in a similar manner. If any thorns remain, as for example at the place where it was held by the tongs, the branch must be held over the fire till all are burnt.

As blow lamps are almost unobtainable, the lohar's forge is probably the best method for general use this year. It should be fixed up, if possible, in a shed protected from the wind.

Preparation of Burnt Prickly Pear :—When the pear is burnt, it should be rubbed over with a stiff brush or a piece of gunny bag to remove any fine thorns and hairs remaining. Then it should be cut up either with choppers on a log of wood, or with a chaff-cutting machine. When animals are first fed with it, the cutting should be to very small pieces, but, later, the pieces may be up to one or two inches square.

Systems of Feeding Prickly Pear :—The animals should be *gradually* accustomed to the food, otherwise it may lead to purging or to tympanitis, as in the case of other green fodders.

The following is a good method of using the prickly pear.

(a) When the animals are new to this fodder, the following ration should be used:—2 pounds prickly pear with 2/3 pound cotton seed, linseed meal, or any oil cake. This should be given three times a day (making 6 pounds prickly pear and 2 pounds of the other food per day), for the first week. This requires to be supplemented with three pounds of dried grass or *kadbi* per day.

(b) After the first week, the prickly pear ration may be increased to from eighteen to thirty pounds per day, according to the size of the bullock or cow, and to the succulence of the prickly pear. Along with this, at least half a pound of dry food, preferably cotton seed or oil cake, should be mixed and given *every day*. A little grazing or, in its absence, about three pounds of dried grass or kadbi should be given if possible, as an addition to the above ration. It is advisable to give a little salt. Animals in cattle camps should have some exercise, and be watered twice a day.

Mr. Norton has found at Dhond that, after cattle have been feeding on the above ration for some time, they will thrive on prickly pear alone.

Demonstration.—It is advised that any one wishing to use this method of feeding should visit a centre where the use of prickly pear is in operation. At present it can be seen and shown at the following places:—

(a) The Poona Agricultural College Dairy, near Mariai's Temple, Kirkee.

(b) Rev. A. Norton's Farm, Dhond, District Poona.

(c) Ahmednagar (under the control of the Collector of Ahmednagar).

No doubt more centres will shortly be inaugurated, and information as to these can be obtained from the Collectors of each district.

Treatment of Animals becoming sick.—In the event of any animal suffering from tympanitis, purging, or indigestion from this food, a dose of sweet oil (from half a bottle to a bottle) should be given, and another diet substituted for the time being. In cases of severe tympanitis, the Veterinary Department will be very pleased to give every assistance.

If any animal appears distressed, or any salivation noticed, the tongue and mouth should be examined, and if any thorns are found, they should be removed.

SERICULTURE.

Utilization of Indian Silk.

Mr. R. C. Rawley's Report.

The report on an enquiry into the utilization of Indian silk in Great Britain and France by Mr. R. C. Rawley, investigator in industrial economics, has been published. This is a highly technical publication and is divided into three parts. Part I deals with the British silk industry. A picture of silk industry in England and Scotland has been given to show the nature of its products, and to define its main branches. Each branch of the industry has been taken into consideration with a view to find out the quality and the kind of raw material used in it. The weaving branch of the industry has been discussed first and has been shown how far Indian raw silk could be introduced into the market to satisfy the demand of the manufacturers. The principal defects found in these silks have been pointed out to indicate the importance of a good raw silk and to show that if these defects were remedied there would be a great demand for these silks in this country.

Several outlets have been pointed out for raw silks of comparatively inferior qualities. The spinning branch of the industry has been explained in detail. A thorough enquiry has been made into the utilization of different kinds of wastes in spinning. The defects which render Indian wastes useless in some cases have been pointed out and improvements have been suggested. It will be interesting to note that the commercial value of Indian wastes could be greatly increased if due attention were paid to their collection and packing. A chapter has also been devoted to Indian wild silks. The possibility of increasing the export of Tasar and Eri has been discussed in this chapter.

Part 2 deals with the French silk industry. The subject has been treated on practically the same lines as the above. The difference lies in the different aspects of silk industry in France. In addition to weaving and spinning there we have the production of cocoons and reeling. This opens another channel for Indian cocoons and attracts our attention. In this section a description of the Lyons conditioning house has also been given and various processes of testing and sizing have been briefly explained. The great commercial utility of this institution has been pointed out in order to give an idea of the benefits the French silk trade derives from it.

Part 3 deals with the important problems of prices, consumption and commercial organization. Mr. Rawley also deals with the question of the control of silk trade in India. Two practical methods may be mentioned here. The first is the system of state control under which the industry is entirely controlled by the Government and the export trade is conducted by the Officials of the State. The system is at present practised in Kashmir where the State controls the production of raw silk as well as its export trade. The system appears to be quite satisfactory and the State undoubtedly receives a large revenue from this useful industry, but there are certain hidden discrepancies which show themselves after a number of years. The producer is never wholly satisfied. In some cases he works under compulsion. Even in a perfect organization the State cannot do justice to individual merits and the result is that some of the workers do not devote themselves to their work in the same spirit as they would if they were working independently. Moreover there is another serious objection to the system of state control. This is the ultimate effect of this system on private enterprise. An industry flourishes most when each and every member engaged in it has certain responsibility and pays full attention to its development. This is not possible under strict state control. The spirit of private enterprise should be cultivated and developed in India so as to widen her resources of raw silk. If the production of silk and its export are under state control there is no possibility of giving an impetus to private enterprise.

The second system that may be safely advocated is that of private enterprise aided by state capital. Leading capitalists interested in the industrial development of the country should be brought together to realize the importance of the project and a company should be formed to take charge of the export trade in raw silk and waste silk. As in every other new enterprise there is always an initial shyness and fear but as the prospects begin to appear brighter and encouraging the resolution becomes firmer and more determined. If this enterprise is backed up by state capital there is no reason why the scheme should not turn out successful. A large amount of capital is required to carry out the project and it is, therefore, necessary that the state should take an active part in its working. It must be remembered that a revival of the Indian silk industry means that there is a tremendous task before the country and so long as the industry is in the stage of infancy state help of some kind is essential. It is not merely a matter of local development but a matter that involves world competition. The production of silk in France, Japan and other countries is backed by state bounties and the interests of the industry are guarded by the state. In so far as India is concerned financial help by the Government would go a long way and the industry would develop more quickly than if it were left to mere private enterprise. With regard to the export of raw silk and waste silk it is advisable that a corporate body be formed in India to control the collection, grading and shipping of these commodities. This body may be called the Indian Silk Association. The great advantage of this corporate body would be that it would be in touch with the British Silk Association, the Silk Association of America and other similar bodies in other countries. It would represent India's silk interest and would be a medium of general information about the silk trade of the world. This form of control, in my opinion, is beneficial not only to India but to England as well because it involves identity of interest and shows a spirit of mutual help. Considering the present situation of the world's silk trade immediate steps should be taken to develop Indian silk resources. Private enterprise coupled with financial help from the Government would make the industry stable and open new channels for Indian silks. The present opportunity is promising and if steps are taken to organize the industry and the trade before it is too late, there is every possibility that India will play a great part in the fulfilment of England's silk contracts after the war.

INDUSTRIAL USES OF ELECTRICITY.

It may not be generally recognized as a fact of Nature, writes Sir Oliver Lodge in the "Observer," but the production, distribution, and utilization of power is necessarily one of the most vital interests of mankind in the material sphere of things. Our sole physical activity is the movement of matter. By that single activity we construct our houses and furniture, our ships and locomotives, our roads, bridges, and engineering works; we also depend on this one faculty for the cultivation of land, for the production of food and fuel, and in general for providing the forces of Nature with the conditions under which they can operate in the directions required by the needs and comforts of mankind.

Human muscles in the first instance were called upon for the preparatory, stimulating and essentially co-operative work whereby the forces of Nature when properly understood could be controlled, harnessed, and directed in accordance with human wishes. Muscles are now supplemented by innumerable engines, of which two classes, heat engines and electric engines, are chief. The more civilised the country the greater is the proportion which mechanical power bears to merely mechanical human labour; and the higher accordingly can be the remuneration or wages per head. Human muscles are well adapted for displaying or demonstrating ideas, but they are not the right means for propelling machinery nor for shifting or raising loads. Unskilled labour should gradually be superseded as we rise in the scale. For irksome and monotonous tasks we can utilise wind and water power which otherwise would be running to waste; we can draw upon the store of energy in coal and oil fields; we can employ the past or present radiation of the sun.

Our chief source of motive power at present is combustion, utilised by aid of the steam-engine or by internally-fired engines: and the power thus generated can be transmitted to considerable distances by means of electricity. Or, if intense heat is the ultimate object, chemical energy is transmissible over fairly considerable distances in the gaseous form, in which form it can be burnt just as and where and when it is wanted. Thorough control is

Hitherto our methods of utilising natural power have been dirty and wasteful. We have been content to dig up coal in enormous quantities, transfer it to a distance on lines of rail, cart it to its destination, and there burn it crudely and ignorantly and incompletely, so as to be troubled not only with dusty ash, but with the more volatile products of incomplete combustion let loose into the atmosphere. The result has been that the great majority of the English race now live under a perpetual pall of thin smoke; to which indeed, they get accustomed, but which undermines their health and lessens their vigour.

In Elizabethan and other great periods of English history the towns were not big and the atmosphere was clear. This fact should be realised when reading history. True, the less said about the drainage system of our ancestors the better—we have learnt a great deal about sanitation since then, and we have applied much of our knowledge—but we still turn the excrement of our furnaces into the common atmosphere, and thereby foul our lungs in a way which is both senseless and extravagant as well as unhealthy.

What is the remedy? First to deal with coal as what it is, a great admixture of valuable hydrocarbons, many of which are far too good to be merely burnt; these can be separated out and employed for chemical and agricultural purposes, so that only the refuse gas and coke shall be left for burning. And these residual products can then be burnt completely and cleanly. That is the first step. Next, we must realise that solids do not travel freely, nor can they be conveyed so easily as gasses and liquids; these can be much more readily transmitted to a distance; while as for the travelling power of electricity, it is so extraordinary as to have become proverbial. It is literally as quick as lightning.

Coal itself should not be sent on journeys; it should be dealt with chemically, in suitable retorts, at or near its source, in a way which is becoming well-known now to gass engineers. Gass can be transmitted through pipes to centres of population for the production there of easily manageable heat, without encroaching on town area for the erection of unsightly corporation gas works. Electricity can likewise be generated and distributed for purposes of convenient and healthy power and light.

To carry out the generating and distributing system economically, overlapping of many conflicting interests must be avoided; hence it must be done on a large scale. To this end the unit of local self-Government must be a large one. Devolution of much central business to large provinces has often been advocated, as getting free the central Parlia-

dignified provincial Senates will undoubtedly come into existence sooner or later, and the urgency of the need for effective power distribution will probably hasten this reform. The conditions of average human existence hitherto have really not been reputable, considering the amount of knowledge now available if it were effectively used. When the country has adopted a well-thought-out plan for the scientific use of fuel, instead of the present crudely barbarous method of flinging lumps on to a fire, everyone will be amazed and rather chagrined that it was not adopted long ago. It seems likely that half the need for crowding people in factories will then disappear. With easy power that can be switched on and off, home industries in modified form may perhaps revive. In the old days Sheffield cutlery was produced by small workers living by the side of a stream. The conditions of home labour were not ideal in many respects, but they were human, and permitted individuality and some kind of family life.

Why is distributed power, whether chemical or electrical, so handy? Because electric power and gaseous fuel lend themselves to regulation by the turning of a tap—"perfect control" and "economy" are almost synonymous terms—and when all the other improvements which we owe to the nineteenth century are incorporated with this great overdue improvement, surely human life will begin to emerge from that dull, depressed, and discouraging condition which now characterises so much of it. May it not be this which is at the root of a good deal of the labour discontent? Indeed, it is doubtful if those workers who return from the varied, adventurous, though dangerous life at the front will be content to immerse themselves in the old unamended factory routine.

It may seem a small thing to have heat, light and power economically and conveniently laid on to every dwelling and small factory, but it is a big thing in reality. The difference between living in clean healthy air, through which the sun's rays can penetrate—not only the heat rays, but the health giving, bronzing, disease-destroying rays for which we go to the seaside—this alone will have on elevating effect on the spirits of adults and an untold effect on the health of children. For children have not had time to get acclimatised to evil surroundings; they die in large numbers, and through their deaths the population is restricted in the saddest and most wasteful manner.

Life, more Life, is what we must aim at, not mere existence, but life, clean air, healthy surroundings, are its essential conditions. Hours of monotonous toil must be reduced, leisure for higher work must be gained; and with an untruncated system of education it may be hoped that widespread happiness will result. The depopulated country may become full and interesting once more. Given the easy distribution of light and power, there is no need for people to crowd into close-packed dens and pay exhorbitant rents for the privilege of living near their work. Distribution rather than concentration of the people can begin.

It may be urged—on the score of expense and limitation of material—that a conductor better than copper is desirable; perhaps ultimately such a conductor may be necessary. Well, who can say that it will not be forthcoming? If a metal is kept sufficiently cold it will transmit an electric current with hardly any loss of energy. A perfect conductor is not physically impossible. Impractical on the large scale as yet; yes. But when science gives us a hint like that we should receive it with avidity, give it our best attention, and look out for some way of utilising the fact in practice. We do not yet see how. No, but many things thought impossible have turned out feasible enough in the long run. If only the State would encourage lavishly, first, pure science, secondly, the applications of science, corporate life both in town and country might be revolutionised in a generation. Already messages and correspondence are distributed, with splendid organization, by telegraph and post. Distance has thereby already become comparatively unimportant.

Among the reconstructions made possible by the war—made possible by the opening of men's minds to larger possibilities of utilising the already made discoveries of science—let us see to it that potential light, heat and power are generated in the most economical fashion, wherever the raw material is readily available, and let us utilise the travelling power of electricity to the utmost.

INDUSTRIES AND COMMERCE.

United States Government's Commercial Intelligence Service.

An urgent appeal for an expansion of the United States Department of Commerce to meet the demands that will be made upon it, says the *Board of Trade Journal*, as soon as the war is over, has been made by the Chief of the Bureau of Foreign and Domestic Commerce of that Department in an address before the Convention of the American Manufacturers' Export Association at New York.

"There are only eleven American commercial attaches," he stated, "because funds for more do not exist. Our new estimates call for eighteen.

"Instead of being content with thirty travelling agents covering the entire world, as last year, we are asking now for thirty in Europe alone (when the war is over), and as many more in the Far East and South America.

"Our foreign technical service must be reinforced and organized by a force at Washington that can test the work for scientific accuracy, unify it, tabulate it for comparison with previous data, attach correct conclusions, and put it into readable form for merchants. The Bureau should have for this purpose highly competent statisticians, economists, commodity specialists, Customs experts, shipping advisers, and so forth; without them the authority and helpfulness of the Department of Commerce fails completely. Men of such grades receiving decent salaries of three to six thousand dollars are allowed to the regular Government commissions and to some of the War Boards, whereas we are restricted to salaries around eighteen hundred for some of our best research men. As a result the bulk of our work falls upon overworked division administrators who tire out and leave us."

Eventually the Convention was informed that the Department of Commerce should have added to it a Bureau of Industrial Practice that would aid in eliminating waste in man power, time, material, and overhead cost; also a Division of Material Valuation, for studying the original sources, the handling, and the grades of foreign and domestic materials, a Division of Information on Internal Water and Railways, a Division of Distribution Economy, and a Division of Cost Finding Methods.

"We at Washington," he explained, "are not so lost in the details of our daily routine that we do not frequently lift our eyes to the commercial horizon and see new developments in prospect. The main purpose back of our daily work and our plans for the future is just this: We want to give the commercial public a steady flow of trade and industrial information, comprehensive, straight to the point, and usable. Nor should it fail to deal with every phase of business where there is a fundamental problem. Without such helpfulness and advice our business interests may be outstripped by European operators. For we know that the European manufacturer and merchant, under the spur of war needs, has acquired habits of scientific management that have made him more efficient than ever before. During the last four years he has been forced to measure with sensitive scales his scanty resources in men, materials and time, and certainly our own producers must observe the same rules of scientific precision if they hope to hold their own in competition. There is not the slightest doubt of our ability to meet all comers on an equal basis if we add to our natural energy and ingenuity a determination to be guided by facts properly ascertained and explained. No agency is better able to discover and collect the facts than the Department of Commerce."

CO-OPERATION.

Russian Co-operation during War Time.

The *Russian Co-operator* in an interesting article on Co-operation in Russia during War time says:—

In attempting to present some account of the activities of the Russian Co-operative Movement during the War in the space of a short article, I find it necessary to abandon the idea of giving anything like a complete summary. The subject matter is too immense to be thus condensed; it would be like trying to draw a picture of the world War on the page of a pocket book. Russia itself is so vast, its Co-operative Movement is so complex, it differs in so many material respects from Co-operation in Great Britain, that only confusion would result from trying to depict so great a drama on so small a stage. Moreover, the war has not only blurred the perspective of all things Russian, but the incalculable Revolution has also thrown the wreckage of war into the melting pot, and from that crucible no one may yet say what base metal or pure gold will finally emerge. War and Revolution have also had the effect of so hindering communications, both postal and telegraphic, with Russia, that information is often months old before it reaches this country, making it difficult to speak with any certainty of the latest co-operative developments. I must perforce, therefore, be content, as it were, with just throwing on the screen a few disconnected pictures of Russian Co-operation during war time; the full story can only be told when the fog of war and the smoke of revolution have entirely lifted from the race of Russia.

Co-operative organizations in Russia have shown during the war an adaptability to changed and changing conditions, which speaks volumes for the future of Russian Co-operation. The test of whether an organism is really alive or whether it is a mere piece of machinery lies in its ablity to adjust itself to any modifications of environment. A machine can only do what it is made to do. A living thing can become master even of inimical surroundings. Now, Co-operation is essentially a peace activity. It pre-supposes peace for its very existence. War and all the insecurities arising out of it are anathema to Co-operation. And yet Co-operation has not only survived war, it has grown stronger during its course. If it had been merely mechanical it would have ceased to function under the changed and adverse conditions. For instance, I have before me

Creamery Associations from 1914 down to the middle of November, 1917. Butter making is the main industry of this Union, and I find that there was a progressive increase during those first four calendar years of the war which is almost startling. In round figures the butter sold in 1914 was seven million roubles, in 1915, 16 million roubles, in 1916, 58 million roubles and during ten and a-half months of 1917 the value of butter sold exceeded 103 million roubles. Cheese, which, comparatively speaking, has been an unimportant side line, although there may be great developments for this in the future, showed a decrease, however, from 663,839 roubles in 1914 down almost to the vanishing point in 1917; but under the heading "Various Implements and Goods Supplied," there was an increase from 663,539 roubles in 1914, to 1,779,706 roubles in 1917; while under the heading, "Various Goods Supplied from Warehouses," the figures jump from 7 millions, to 19 millions. Similarly with such commodities as "hay, meat, pork, fat, etc.," the increase was from 4 millions to 9 millions.

With the progressive rise of price, however, the rouble has been a uncertain method of comparison, and, lest it may be thought by some that these increases are entirely illusory owing to the decreasing value of the rouble, it may be pointed out that whereas in 1915 the Union supplied the Army with 983,441 poods of butter (a pood equals 36 lbs.), in 1916 this was increased to 2,942,307 poods. The following comparative statement of supplies of all kinds to the Army is also interesting:—

During 1914	4,27,4000 roubles
During 1915	17,344,000 ,,
During 1916	62,470,000 ,,
Up to September 1st, 1917.	115,011,000 ,,

The Union's return from which these figures are taken also speaks of some of its manufacturing enterprises, either actual or contemplated. Among the former are soap works, a butter factory, rope works, and a cooperage for the manufacture of butter tubs; while contemplated enterprises include a tannery, a boot factory, a spinning mill, and a factory for the manufacture of printing materials. Admitting that contemplation is not realisation, the bare-fact that such enterprises should even have been considered in war time shows an awareness of after-war possibilities which is at least encouraging in the outlook for the future.

The following table shows the turnover of the Union from 19th October, 1916, to 1st May, 1917, or, roughly speaking, six months:—

Butter	27,347,108 roubles.
Cheese	220 ,,
Tallow, Pork, and other products	9,377,658 ,,
Various materials for Butter produce	631,858 ,,
Goods for Artels shops ...	8,432,594 ,,
Printing	58,236 ,,
Total ...	45,847,664 ,,

The Moscow Union of Consumers' Societies (now the All-Russian Central Union) has also made great strides during the war. The rapid progress of this organization is shown by the fact that whereas in 1909 the Union comprised only 300 societies, with a turnover of £200,000, the number of societies included in the Union had by the end of 1916 increased to 3,000, and the turnover to £9,000,000. In 1917 the Union also established a foreign buying office in London, right in the centre of the world's produce exchange. War conditions, shortage of tonnage, the closing of ports, Governmental restrictions upon imports and exports have, of course, greatly hampered the work of the London buying office, but the mere fact of establishing a foreign buying agency during war time is sufficient evidence of energy and foresight. Even before the London agency was opened, that is during the first six months of 1917, the Moscow Union had from its central offices in Moscow arranged for the import from abroad of large quantities of rice, cocoa, coffee, pepper, spices, and textile goods, and with the London buying centre now established, once war restrictions are removed, and when Russia is again in a settled state, the developments in this direction give promise of being immense. Even in 1916 the Union imported about 40 per cent of all the herrings which were brought into Russia, and in 1917 the Union was the biggest Russian importer of coffee and rice, facts which speak for themselves.

Readers of the "Russian Co-operator" have quite recently been made familiar with the operations of the Union of Siberian Co-operative Unions, "Zakupsbyt" (Purchase Sale) so that it is unnecessary to deal with this to any extent. But its remarkable progress may be seen at a glance from the following figures of its turnover in different months of 1916 and 1917:—

July	1916 ...	77,458 roubles.
August	,, ...	290,820 ,,
September	,, ...	590,761 ,,
October	,, ...	617,270 ,,
November	,, ...	670,648 ,,
December	,, ...	1,102,763 ,,

January	1917	... 1,145,380 roubles.
April	,,	... 1,881,564 ,,
July	,,	... 2.996,578 ,,
October	,,	... 3,863,994 ,,
December	,,	... 8,955,464 ,,

I now come to the Moscow Narodny Bank, which I have left to the last, not because it is the least important of the great Russian co-operative organizations, but because its prosperity and progress largely depend upon, or, at least, must be intimately associated with, the general success of the whole co-operative movement of Russia. A co-operative bank, especially upon the large scale of the Narodny Bank, would be almost unthinkable without a co-operative movement to provide it with the atmosphere, so to speak, of its existence. And, while the Bank itself is a source of strength to its allied co-operative concerns, it could not flourish unless these flourished also. Aud from the fact that co-operation generally has made progress in Russia during the war, we may rightly, draw the conclusion that the possibilities of co-operative banking development have increased proportionately. I do not intend here to go lavishly into figures as to the Narodny Bank's increasing properity, but I may mention one or two significant and symptomatic facts concerning its activities. When the Bank opened its office in London it was only as a buying agency for the central establishment in Moscow and during the war it has been one of the main arteries for the import into Russia of seeds, insecticides, fungicides, binder twine, and other agricultural requirements, the value of the goods thus handled by the London office of the Narodny Bank ruding the first eight months of 1917 amounting to over £98,000, a sum which would have been vastly exceeded but for export restrictions and scarcity of tonnage. In addition to such activities, the London office has recently opened a financial branch for accepting deposits, opening current accounts, and transferring money to and from Russia. This last item will probably prove to be the most important of its purely financial activities. Two considerations make this probable. First, London is the financial centre of the world. The part it plays in international trade is colossal. If co-operative Russia is therefore to operate on a large scale as importers and exporters the existence of such a financial organization in London is essential. The second consideration is that the Moscow Narodny Bank has been recognized by the Russian Government as an important agency in the work of conducting foreign trade and in its purely co-operative capacity the Narodny Bank is interested in exporting from Russia, tar, pitch, turpentine, timber wool, bristles, eggs, frozen meats, and dried fruits; and, with regard to imports, is similarly interested in pig-iron, steel, wire, iron plate, as well as the purely agricultural commodities previously mentioned. The production of timber and flax in Russia are also rapidly passing into co-operative channels, and the Moscow Narodny Bank will doubtless play an important part in financing the export of the goods.

Readers of this very incomplete and partial survey must bear in mind that Russia, in the industrial sense of the world, is, comparatively speaking, a young country. But it has been violently convulsed both by the war and the Revolution, and when these disturbing influences cease to produce their effects, when transport becomes fully restored, when industry springs up Phœnix-like from the ashes of an old and destroyed order of things, when education begins to penetrate to the remote villages and hamlets, the ferment will have its effect, and the best judges confidently assert that Russia will take great strides in the coming triumphs of civilisation. And if so much of co-operative effort has been possible in the industrial infancy of Russia, if, despite the war and despite the subsequent chaos, co-operation has held its own and even made progress we may rest assured that in the future civilisation of Russia the co-operative movement will play a worthy and a leading part.

BANKING AND FINANCE.

Land Bank of Egypt.

Apropos of the discussion on a Land Bank for Mysore, the following report of the directors of the Land Bank of Egypt for the year ended September 30, read at the general meeting held in Alexandria on December 3, will be read with interest :—

Continuing to enjoy, under the British Protectorate, favourable conditions such as no other belligerent country has known, Egypt's economic position has been maintained and improved. A succession of favourable Niles has enabled the land to yield varied crops, the price of which has reached a level hitherto unknown. The wise measures taken by the Government have reduced the cultivable area reserved to cotton, the principal export, but have had the truly gratifying result of developing specially the production of the cereals necessary for feeding the people and of inducing the cultivator to redouble his efforts to produce commodities of prime importance, avoiding also, as far as possible, the dangers of an undue concentration upon one crop. The

cotton crop exceeded 6,300,000 quintals (Kantrs), and the price obtained gave the produce on excellent return, despite the increased cost of labour and of certain indispensable materials, such as fuel. The total value of that crop was considerably more than £E50,000,000. The position of the Land Bank of Egypt, closely connected with that of the landed proprietors, has naturally been affected by the prosperity of the country. Receipts in cash have been exceptionally high; in view of the state of our finances, we have thought advisable to repay to the Credit Foncier Egyptien the advance which that establishment had granted us in 1913 until the circumstances permitted an issue of shares. In using certain of its powers of disposal for the transfer of funds to Europe, by the advantageous state of the exchange or for investment in Government loans, easily realisable, the company has not been unmindful of its chief purpose. It has closely followed the resumption of transactions in mortgages, already begun last year, and has concluded a certain number of loans, observing, notwithstanding the marked rise in land values, the prudence necessary in the valuations of the securities offered. These loans number 91, for a sum of £E431,135,099, which, added to the existing loans and to our realisations by sales, brings the total of our transactions guaranteed by mortgage on vendor's privilege, to £E3,455,675,675. Our annuities in arrears have been reduced from £E378,501,032 to £E216,184,950, of which £E90,775,853 are arrears correctly so called, and £E125,409,105 are loans maturing during the year. The settlement of our property continues in satisfactory conditions, and, thanks to favourable circumstances, our account "real property expropriated" has fallen from £E222,974,330 to £E143,100,024. While continuing to set aside interest of which the recovery appears uncertain, the profits of the year are increased to £E326,997,576, against £E323,062,263 for the last year. Our general expenses are increased in consequence of the necessity for improving the position of our staff, who have shown great devotion to our interests, in granting them supplementary allowances. Various charges, such as general expenses, sundry taxes, etc., give a surplus of receipts on expenses of £E148,573,020. Your board proposes to strengthen the bank's position in the following manner:—(1) Provision for the amortisation of debentures, premiums, and charges, £E13,528,681; (2) amortisation of real property, movables, and brokerage on mortgages, £E5,409,578; (3) provision for risks on loans and the amortisation of the property, £E21,000, or a total of £E39,938,259. The net profit of £E108,634,761, to which is added the balance from the previous year, will allow of the distribution of a dividend of 8s. 6d. per ordinary share and of £3 on the founders' shares. In expressing to those members of the staff in the Allied Armies our wishes for their happy return after the victory, definitely obtained to-day, we take the opportunity of thanking their colleagues who have assisted us with the greatest devotion. In the course of the past year we have had the sorrow of losing our president, M. Jules Charles Roux. You know the very important place he held in business circles. President or director of leading financial houses, he applied to his varied interests his unrivalled intelligence, his experience of men and affairs, and his energies. At the same time his kindness and courtesay made him one of the most notable and most appreciated personalities of our time. Director of our company from its foundation, he became its president in 1912, and since that time he followed more and more closely the development of our business. In honour of his memory your Board has set aside a sum for the award of 300 francs each year to the children of a sailor of the French mercantile marine who has died in the pursuit of his duty. We are confident that this meeting will decide to give us its support in this act of rememberance. To the family of our president we express our heartfelt regret and condolences. Associated with him since the opening of our business was our auditor, Mr. A. Gorra, whose loss we also have to deplore. He fulfilled perfectly the duties with which we entrusted him, and he leaves behind him the memory of a good man.

MYSORE ECONOMIC CONFERENCE.

INDUSTRIES AND COMMERCE COMMITTEE.

Half-Yearly Report of Work Done.

The following is a brief Report of work done during the half-year ending 31st December, 1918:—

I. Important Schemes Under Operation.

1. The Mysore Dasara Industrial and Agricultural Exhibition of 1918.

The Government in their order No. 9136-85/A. & E. 47-17-39, dated the 13th March 1918, having directed that the Dasara Exhibition of 1918 be thrown open to the whole of India, the All-India Exhibition was held from 12-10-1918 to 26-10-1918 as per programme previously issued. It was opened by His Highness the Yuvaraja, Sri Kantirava Narasimharaja Wadiyar Bahadur, G.C.I.E. On the

occasion of the opening ceremony, Mr. A. R. Banerji, C.I.E., M.A., I.C.S., President of the Exhibition Committee, delivered an interesting and instructive speech in the course of which he reviewed the activities of the State in Industrial and Commercial matters in the light of those of other countries having similar conditions like Egypt and of those of more advanced countries like France and Italy. He also touched upon the reconstruction policy proposed to be adopted in these countries.

A course of lectures by eminent men and demonstrations by experts had also been arranged during the Exhibition period.

In spite of railway transport difficulties a large number of exhibits were received from different parts of India and some Native States. Many of the State Departments co-operated with the successful working of the Exhibition by sending useful exhibits and by arranging for practical demonstrations. The total number of visitors was above 30,000.

2. DEVELOPMENT OF RURAL AND MINOR INDUSTRIES.

The Sub-Committee for the consideration of the above subjects met on the 14th December 1918, and passed certain resolutions which will be placed before the Central Committee for final consideration.

The Sub-Committee have emphasized the need for a Special officer to look after the development of Minor Industries and Commerce in urban and rural areas.

3. MANUFACTURE OF LAC-DYE AND VARNISH.

In February 1918, Government sanctioned the establishment of a small experimental factory for the manufacture of Lac-dye and Varnish as per scheme submitted by the Department of Industries and Commerce. The Director reported that owing to Railway transport difficulties no lac could be had from outside and as such the industry could not be started till now. In October last, a copy of the press communique issued by the Government of India *re* an improved method of cultivating lac, was referred to this Committee for opinion. The question of developing the industry is being investigated in consultation with the Conservator of Forests.

4. ESTABLISHMENT OF MODERN HINDU HOTELS IN TALUK AND DISTRICT HEAD-QUARTERS.

(*a*) *Bangalore Hotel.*—The concessions granted to the proprietor of the Bangalore Hotel ceased from 5th November 1918, and Government have extended the lease of the present building on certain conditions for four years more. The hotel is a very popular and an useful institution. From July 1918, up to the end of the year 496 persons have put up in it. It is gratifying to note that people have commenced to stop in it with their families also.

(*b*) *Mysore Hotel.*—This hotel is equally popular and useful. The total number of persons put up during the period under review is 328.

(c) *Chikmagalur Hotel.*—After the inspection of the concern by the Secretary to the Industries and Commerce Committee, the subject of granting further concessions to the Hotel was considered by the Committee, which at their meeting held on 28th September 1918, recommended the grant of (1) A house rent of Rs. 25 per mensem for one more year from 1st July 1918, and (2) a loan of Rs. 500 for the purchase of necessary furniture required for the Hotel on proper security. The recommendations made by the Committee were sanctioned by Government in their order No, 4750-1/M. 96-18-6, dated 2nd December 1918. From July last 120 persons have put up in this Hotel till the end of the year.

(*d*) *Tumkur Hotel.*—The following concessions recommended by the Committee were sanctioned by Government to Mr. Venkatasamy Iyer of Tumkur who has been working the concern since 15th July 1918.

(1) A loan of Rs. 500 on proper security repayable within a year at 4 per cent interest per annum,

(2) A monthly grant of Rs. 30 for one year, and

(3) an advance of Rs. 600 for the purchase of furniture, etc., free of interest and repayable within three years, the articles to remain the property of Government till the repayment of the advance.

The affairs of the concern are being supervised by a local Sub-Committee. 120 persons have stopped in the Hotel during the period under review.

(*e*) *Kadur Hotel.*—Certain concessions sanctioned by Government in their order of the 21st March 1918, in favour of Mr. Venkataramaniah Chetty were not availed of as the party was not able to furnish proper security for the loan. A fresh application received from another candidate is under the consideration of the Committee.

On a report by the Secretary, Industries and Commerce Committee, Government passed an order on 17th September 1918, prohibiting the sale of liquor in the State-aided Hindu Hotels.

5. TAILORING.

The candidate deputed from Kadur District to Bombay for practical training on a scholarship granted by the Committee returned after completing his course, in last June. The Committee are watching how far the training acquired by the student will be useful to him in his future career. Pending the receipt of definite information regarding the student, the question of granting further scholarships has been deferred for the present.

6. Grant of Takkavi Loans for Industrial Purposes.

During the period under review, the following loans were sanctioned by Government on the recommendation of the Committee :—

1. A hire purchase loan of Rs. 18,000 to Mr. K. Narniah of Kolar for starting a Rice Mill.
2. Loan of Rs. 6,000 under, hire purchase system, to Mr. Jungappa of Mysore for improving his Rice Mill.
3. Loan of Rs. 10,000 to Messrs. Thimma Bhat and Ramakrishna Bhat of Tirthahalli for enlarging their Rice Hulling concern.
4. Loan of Rs. 10,000 to Mr. H. Rangaswami Iyengar of Mysore for starting a brick factory.
5. Loan of Rs. 20,000 to Mr. A. Ramanna for starting a Rice Mill.
6. Loan of Rs. 13,600 to Mr. Seshachar of Hole-Narsipur for starting a Rice Mill.
7. An additional loan of Rs. 2,000 to Messrs. Krishna Jois, Siddalinga Chetty and Venkatasubba Chetty of Krishnarajapet for the purchase of accessories required for their Rice Hulling concern.

The following loans were sanctioned by the Chairman :—

1. Loan of Rs. 5,000 to Mr. B. N. Hanumanthappa of Chickmagalur for the purchase of an oil engine.
2. Hire purchase loan of Rs. 4,100 to Mr. Y. Aswathanarayana Rao of Yedatore for improving his Rice Mill.
3. Hire purchase loan of Rs. 5,000 to Mr. M. Subbayya of Magadi for starting a Rice Mill.
4. Loan of Rs. 5,000 to Messrs. K. Gurulingiah and Siddalingiah of Sagar for improving their Tile Factory.

7. Development of the Tile Factory.

The Committee recommended to Government the grant of permission to Mr. Mahammadali to take clay from the tank beds free of charge. In the meantime, the Deputy Commissioner, Tumkur District, has recommended the concession being granted to a joint-stock concern instead of to Mr. Mahammadali. The question is yet under the consideration of the Committee.

Mandikal Tile Factory.—The grant of certain concessions prayed for by this factory was referred to the Director of Industries and Commerce for opinion. The Director is not in favour of granting any concessions to the concern. The subject is pending final decision of the Committee.

8. Introduction of Rice Mills in Paddy Growing Centres.

On the whole 8 loans were sanctioned to encourage the starting and improving Rice Hulling concerns.

9. Cocoanut Fibre Industries.

As a result of the deputation of two merchants from Tumkur District accompanied by Mr. G. Santhaveerappa, District Economic Superintendent, to Ceylon, Cochin and Travancore, the Government sanctioned to Mr. Hanumantha Gowda of Chiknayakanhalli, a sum of Rs. 5,000 to start a Coir Factory. As the party died before availing himself of the loan, no progress was possible in this direction. The Sub-Committee to consider this question will meet in February, 1919.

10. Training of Young Men in Crafts and Industries.

(a) The Sub-Committee to select candidates for these scholarships met on 24th August 1918, as per G. O. No. 5271—5/A. & I. 146-15-2 dated the 24th March 1916. Thirty artizan scholarships were to be awarded for the training of young artizans in workshops both inside and outside the State. The Secretary, Industries and Commerce Committee, had received a large number of applications from the District Economic Superintendents. But as many scholarships as were sanctioned in the G. O. could not be given, since the Director of Industries and Commerce represented at the Meeting of the Sub-Committee that he did not make provision in his budget for these scholarships.

The progress of the six students now undergoing training in Bombay is reported quite satisfactory.

(b) Two students are given scholarships direct by the Committee to study dyeing at Cawnpore. Their progress is satisfactory.

(c) The Inspector-General of Education had sent a note for the consideration of the Committee, proposing that the present artizan scholarships of Rs. 5, 7-8-0, and 10 be increased to Rs. 10, 15 and 20 respectively so that they might attract a larger number of students than they did at present. The Committee approved the proposals of the Inspector-General of Education.

(d) Scholarship to an Apprentice to Study Soap Manufacture.—The Committee granted a scholarship of Rs. 25 per mensem for three months with to and fro travelling allowances to a candidate from Kadur District to learn soap making at Bangalore in the Government Soap Factory.

11. FURTHER DEVELOPMENT OF PAINTS.

From the report received from the Mysore Royal Paint Works, it is learnt that the paint works are considerably enlarged of late on the side of manufacture. The concern is reported to be patronised by the several Departments in the State. The paints are said to be popular not only locally but have come to be widely known outside the State. The value of sales effected till October last is shown in he following tabular statement :—

Mysore State.		Outside.	
Government Departments.	Public.	Government Departments.	Public.
Rs. 4,750	Rs. 800	Rs. 1,460	Rs. 1,972

Total value of sales is nearly Rs. 9,000.

II. Schemes Sanctioned but which have to be worked out Further.

1. FURNITURE FACTORY.

The Dewan when he held the merchants' meeting at Bangalore on 20th July 1918, made a reference to the establishment of a Furniture Factory. A number of merchants came forward to start the factory. In the Confidential Responsibility sheet issued by Goverment on 15th August 1918, the work of establishing the factory was entrusted to the Deputy Director of Commerce and to Mr. Barton.

The Sub-Committee appointed to consider the question of establishing a Furniture factory met twice on 17th August 1918, and 27th September 1918. Though it was largely advertised, it was regrettable that the attendance was very poor. It was proposed by the Convener, Mr. P. A. Barton, that to make the concern a really paying one, the value of each share should be Rs. 5,000. It was resolved that those present at the second meeting should circulate this idea largely among their friends and others who are interested in the concern. Till now no application has been received.

2. THE CENTRAL INDUSTRIAL AND COMMERCIAL MUSEUM.

In their order of the 28th September 1918, Government directed that the Industrial and Commercial sections of the Museum should be separated and placed under the Director of Industries and Commerce and the Deputy Director of Commerce respectively.

The Industrial Museum has been located in the Exhibition premises and the Commercial Museum in

The working of the Commercial Museum is reported to have begun in the month of October. The Commercial Museum has purchased the Japanese exhibits specially got by the Exhibition Committee for the last Exhibition to illustrate the Industries carried on in Japan as "Home Industries" and by women and children.

The Deputy Director now in Burma is reported to have received from Government a grant of Rs. 1,000 to buy Burmese exhibits for the Museum. The report on the working of the Industrial section of the Museum is awaited.

III. Schemes under Investigation.

1. CANNING OF FRUITS AND PREPARATION OF EDIBLES SUCH AS JAMS, JELLIES, ETC.

It is under contemplation to print the lecture given in connection with practical demonstrations by Mrs. Wiser of Allahabad at the recent Exhibition in the form of a bulletin of the Committee.

Further steps for the development of the industry will be considered in the Sub-Committee which will meet in this half-year.

2. DEVELOPMENT OF LEATHER INDUSTRY.

The recommendation of the Sub-Committee which met in December 1918, is deferred pending the receipt of a report from the expert recently appointed by Government to investigate the possibilities of developing the Industry.

3. INVESTIGATION OF THE MINERAL RESOURCES OF THE STATE WITH REFERENCE TO INDUSTRIAL DEVELOPMENT.

The Sub-Committee on the subject met on 10th September 1918. On the recommendation of the Committee Government have recently sanctioned a sum of Rs. 5,000 in the first instance to be placed at the disposal of the Director of Geology for carrying on practical investigations about the occurrence of limestone, etc., which were necessary in common for most of the industries that were desired by the Economic Conference to be started in the State. It is reported that arrangements have recently been made by the Department to conduct experiments in Mandya Taluk.

4. LAUNDRY.

This was another subject referred to by the Dewan at the merchants' meeting held in Bangalore and Mysore on 20th and 5th July 1918 respectively. Mr. Usmankhan came forward to start the industry on certain Government concessions. His application was considered by a Sub-Committee which met on 30th August 1918. The Central Committee to which the Sub-Committee's report was submitted sent back

In the meanwhile, the Secretary, Economic Conference, sent another application from the same party. This too was rejected and sent back by the Industries and Commerce Committee to be submitted through the proper channel, *viz.*, through the Director of Industries and Commerce and with his recommendations.

5. Bangle and Glass Industry.

The proposals of the Director of Industries and Commerce to conduct certain experiments in glass manufacture locally with the help of an expert at a cost of Rs. 1,000 were referred to the Committee by Government for opinion. The Committee recommended to Government to approve the proposals of the Director.

6. Manufacture of Umbrellas.

The suitability of the Mysore bamboos for the manufacture of umbrella handles is being tested by the Department of Industries and Commerce and the result of experiment is awaited.

7. Increase of Transport Facilities.

The Kadur District Committee recommended the grant of a loan of Rs. 500 to Mr. Abdul Ravoof Sahib of Mudigere taluk for opening a country cart service. The Committee have referred the subject to the Malnad Improvement Committee who have in their programme, the question of improving the means of communication in the Malnad parts of the State. The Sub-Committee on the subject will meet in the ensuing official half-year.

8. Development of Pencil Industry.

The Special Forest Officer to whom the subject has been referred for collecting sufficient data has since completed his survey of the different kinds of woods available in the Shimoga and Kadur forests and he is of opinion that Mysore has enough raw material to turn out 500 gross of pencils a day. It is reported that a second hand plant estimated to cost about Rs. 40,000 is available.

9. Manufacture of Matches.

The Special Forest officer who was deputed to Northern India to inspect a second hand match making machinery reported to be available has since submitted his recommendation for the purchase of second hand machinery at a cost of Rs. 33,000 now available at Ellichpur for sale.

The subject will be considered at the next meeting of the Committee to be held early in February 1919.

IV. Collecting and Spreading of Information.

1. Facilities to Merchants to Travel Abroad.

Owing to war conditions it was not possible to depute merchants to foreign countries. Now that the war is over, it is hoped to send a few merchants to Japan to study Industrial and Commercial conditions.

2. Publication of Bulletins.

The Sub-Committee on the subject met on 11th January 1919. It has recommended the publication of a few bulletins and also the mode of their distribution. These proposals will be discussed at the Central Committee Meeting in February.

3. Completion of Standard Development Forms.

The compilation of the consolidated figures for the whole State will be taken up as soon as the final figures are received back from the Districts.

4. Registration of Road Statistics.

The subject has been referred to the Deputy Director of Commerce for practical action being taken in the matter. His report has not yet been received.

V. Miscellaneous.

Under the Presidentship of the Dewan a meeting of merchants and others who were interested in the economic development of the State was held in the cities of Mysore and Bangalore on 5th and 20th July 1918, respectively. At both the places "Responsibility sheets" were drawn up showing the names of merchants who came forward to develop particular industries and other persons and Government officers who were held responsible to see that industries did develop. A time limit was also given in these sheets for the completion and starting of schemes.

The following subjects connected with Industries and Commerce were discussed and were promised attention in Mysore and Bangalore.

(a) In Mysore, Industrial suburb, Cotton Mill, Cotton Seed Oil Co., Weaving Industry formation of a Trading Co., starting a Commercial Club, formation of a Branch of the Chamber of Commerce, Furniture Factory, Boot and Shoe Factories, Brick Factory, Laundry, Power Loom Factory, Up-to-date Weaving Factories, Match Factory, Rug Factory, Woollen Spinning Mill at Mandya, Tannery, Ivory Inlaying Work, City Progress Committee, Publishing a Directory of Industrial and Commercial Firms.

(b) In Bangalore, Oil Mills, Furniture Factory, Wool Spinning Mills, Manufacture of Stoneware Pipes, Rice Mills, Button and Rope Making Machinery, Electric Laundry, Establishment of a small workshop at a central place in the City to assist small concerns, Perfumery Works, Industrial

Workshops, Commercial Club, Handbook of Commercial and Industrial information, Hotels.

2. THE MYSORE CHAMBER OF COMMERCE.

The Committee recommended the renewal of the existing concessions for one more year. The Government have approved of the recommendation.

3. PERIPATETIC BLACKSMITHS AND CARPENTERS.

The blacksmiths and the carpenter whose terms have been extended till the end of the current official year are reported to be doing useful work by way of training local people. The work done by them is as follows :—

Statement of implements and tools newly prepared and repaired by the Peripatetic Blacksmiths and the Carpenter.

Name of District	Blacksmith or carpenter	Names of villages visited	No. of people who received instructions	No. of implements of all kinds newly made	No. of repairs done to the old instruments
Chitaldrug	Carpenter ...	Guntur, Bhimasamudra ...	14	23	...
Do	Blacksmith ...	Siddayyakoti ...	No. not known ...	12	4
Shimoga	Do ...	...	10	22	...
Mysore	Do ...	Ganjam, Kirangue, Makankoppal, Neelamani, Kaithana Halli and three villages.	10	122	...

4. NOTE ON INDUSTRIAL AND AGRICULTURAL CO-OPERATION BY THE REGISTRAR OF CO-OPERATIVE SOCIETIES IN MYSORE.

The note by the Registrar of Co-operative Societies and the Special Committee's recommendation on Hand-loom Weaving Industry were considered by the Committee and their final recommendations were sent up to Government.

5. EXPERIMENTS IN CONNECTION WITH ESTABLISHING A PORCELAIN FACTORY IN MYSORE.

The proposal of the Director of Industries and Commerce to conduct certain experiments at a cost of Rs. 2,500 were considered by the Committee and they have recommended to Government to sanction the Director's scheme.

Government forwarded for the opinion of the Committee, a note on the main principles, practices and methods of work relating to Economic Conference.

The Committee resolved that the Government be requested to forward the proposals said to be formulated by them for making the Conference a permanent body for the opinion of this Committee and that, in case they were not prepared to do so, the Government be pleased to accept certain alternative proposal, given out by the Committee.

M. N. BALA RAJ URS,
Secretary.

AGRICULTURAL COMMITTEE.

Progress Report.

The following is a review of progress for the period ending 31st January, 1919 :—

INTRODUCTORY.

The subjects on the Committee's programme were grouped under 12 heads, and Sub-Committees were constituted to deal with each group. Specific items were also allotted to individual members, and a responsibility sheet was prepared.

I. INCREASE OF FOOD PRODUCTION.

The Agricultural Committee were entrusted with the problem of increasing food production and authorised to place themselves in touch with the Central Transport and Food-stuffs Board at Delhi. The Committee investigated the subject and worked out proposals which have since been embodied in Government Orders. The measures recommended included facilities for getting land on favourable terms for temporary cultivation, and the provision of

seed, manure, impliments, and technical assistance by the Agricultural Department.

Settlement of wandering tribes and landless people.—Detailed proposals have been received from the Deputy Commissioners of Tumkur, Shimoga and Chitaldrug and are under consideration. As this subject has to be studied in close touch with local conditions and in consultation with the administrative Departments of Government, progress has been rather slow.

Consolidation of scattered holdings.—At the last Conference, Dr. Coleman drew attention to the economic waste resulting from the fragmentation and dispersion of holdings in the State. A note has been prepared summarising the proposals made to meet a similar situation in other parts of India, and suggesting action on the same lines in Mysore.

II. ORGANIZATION.

1. Model rules have been prepared for the formation of Taluk Agricultural Associations which have to play an important part in the development of private initative in agricultural matters.

2. The Committee considered the propositions referred to them by the Conference regarding the enlargement of the Agricultural Department and were of opinion that the expansion could only be gradual owing to the paucity of trained men.

III. AGRICULTURAL ECONOMICS.

1. *Economic enquiry.*—Statistics bearing on the economic condition of villages were collected by the Committee's non-official co-operators, and tabulated in the office. A necessary defect has been the lack of uniformity due to differences in standards of valuation. There is a proposal to transfer this work to the Co-operative Department which is said to be engaged in a similar investigation.

2. *Agricultural co-operation.*—The Departments of Agriculture and Co-operation are devoting attention to this important subject and the request of the Registrar of Co-operative Societies that he should be given additional staff for pushing this work vigorously, has been sent up to Government with the Agricultural Committee's support.

3. The Committee have submitted their final recommendation on the establishment of a Land Mortgage Bank for the State, and expressed their conviction that the establishment of a Bank deriving the bulk of its capital from State-secured debentures, and devoting itself to long term credit on the security of land is absolutely essential to the development of agriculture.

IV. STANDARDS OF DEVELOPMENT.

The "Standard Development Forms" were revised and are pending the approval of the Committee.

V. COMMERCIAL CROPS.

Sugar-cane.—The District Committees have at the instance of the Agricultural Committee chosen typical sugar-cane tracts for study with a view to ascertain the facilities which have to be created to bring about a general expansion of cane cultivation. The Special Committee for the establishment of a Sugar Factory are collecting data and conducting preliminary investigations as to the most suitable sugar-cane areas for the purpose. The question of the supply of mills and jaggery boiling sets to meet District requirements is under the Agricultural Committee's urgent consideration.

Pepper.—Investigations are in progress as to the scope for developing pepper cultivation and the facilities necessary to induce people to take it up on a commercial scale.

VI. LIVE-STOCK.

The concessions already sanctioned by Government to stimulate the establishment of breeding farms for cattle and ponies are in operation and their effect has to be studied for sometime before fresh action can be proposed.

Government Sheep Farm, Gottigere.—The experiments with the Merino strain are in progress and promise well. The Dumbas have proved disappointingly susceptible to changes of climate and environment. Further experiments are, however, being conducted. The selective improvement of local sheep will receive attention this year. The Committee have a stock of 107 animals in the Farm at Gottigere.

VII. FRUIT CULTURE.

Work has suffered for want of rain but no opportunity for development has been omitted. Experience has emphasised the necessity for forming nurseries to meet local demand before any really striking results can be achieved and a comprehensive scheme of horticultural work is before the Committee.

VIII. SERICULTURE.

The Committee are in close co-operation with the Department of Sericulture which has been devoting full attention to all branches of work connected with the silk industry.

IX. AGRICULTURAL EDUCATION.

The Horticultural School in the Lal Bagh has been working well. A special course for training Malis has recently been organized. It is ascertained that there is a great and growing demand for the services of trained men throughout the State.

X. STATISTICS OF AGRICULTURAL PRODUCTION.

Figures for almost all the Taluks for the year 1917-18 have been got and are under compilation.

XI. COLLECTION AND SPREADING OF INFORMATION.

The following bulletins and leaflets have been issued during the period:—

1. Consolidation of scattered holdings. *(English).*
2. Silting up of tanks and remedial measures thereto. *(English).*
3. Fruit Culture. *(English and Kannada).*
4. Points to be attended to in jaggery making. *(Hindustani)*

N. RAMA RAO,
Secretary.

EDUCATION COMMITTEE.

The following is a brief Report of work done by the Education Committee in the month of January, 1919:—

Home Industries.—The Instructor of the Tailoring Classes in the Home Industries Institute joined duty on 1st October, 1918. But regular classes could not be held at once on account of influenza in the city. There are now 12 on the rolls. The continuance of the Instructor's services has been sanctioned till the end of February, 1919. Fair progress has been made.

Recommendations were made to Government—

(*a*) For transferring all the Home Industries classes and of the Home Industries Institutes at Bangalore and Mysore to the Educational Department.

(*b*) For deputing B. Nanjamma to the Phillipines to study the methods of developing and organizing Home Industries there.

Applications were invited from qualified persons by notification in the *Gazette*, for the place of the Superintendent of the Home Industries Institute, Bangalore, temporary arrangements being made for the work of the Superintendent.

Physical Culture.—The Physical culture class sanctioned by Government was opened on the 2nd instant. There are at present over 100 pupils. The Inspector-General of Police has sent 22 pupils from the Police Training School and the Inspector-General of Education 10 pupils from the Normal School, for training. About 90 pupils from other schools were selected. The class was being held in the premises of Police Training School at first. For want of sufficient accommodation, it has now been shifted to a rented building near the Fort.

City Economic Lectures.—Mr. H. K. Mallappa, the Economic Lecturer for Bangalore City, reverted to his appointment from his work in connection with war recruitment. He has since then delivered three lectures on 'Duties of Women' and the 'Depressed Classes' Employees and their Union and 'Duties of Men'. The Committee have recommended his appointment as Lecturer for both the Cities of Bangalore and Mysore.

Libraries.—The appointment of a graduate Librarian for the Mysore Public Library and a graduate Librarian for the Bangalore Public Library as well as the continuance of the Ladies' and Juvenile section of the Mysore Library for a further period of two years were recommended to Government.

The appointment of Mr. N. S. Subba Rao as Chairman of the Committee for the Mysore Public Library and the appointment of Mr. B. M. Srikanta Iyya as the Officer in charge of the Library were also recommended to Government consequent on the resignation of Mr. Humza Hussain of the Chairmanship. This recommendation has since been sanctioned by Government.

V. SUBRAHMANYA IYER,
Secretary.

PROGRESS IN THE DISTRICTS.

Chitaldrug.

EDUCATION.

A Scholarship.—Mr. Subbiah Naidu of Ballalasamudram deposited Rs. 500 in the Hosadurga Taluk Treasury for awarding a scholarship, in memory of his deceased son, to the best boy in the Lower Secondary class every year out of the interest realised on the amount. The District Committee resolved to grant the request of the applicant.

A Grant-in-aid School.—A sum of Rs. 120 was contributed by the people of Kondajji for starting a Grant-in-aid School in their Village.

Reading Rooms.—Five reading rooms were started in the Holalkere Taluk.

District Library Building.—A contribution of Rs. 5,000, was secured from the District Board for the construction of the District Library Building.

AGRICULTURE.

Improved Implements.—Twenty-three plough shares were introduced into the District and orders were canvassed for four more.

Distribution of Oil-cake, etc.—One hundred and sixty maunds of oil-cake were distributed, and thirty-two pallas of seed Bilijola were supplied to the Shimoga and Kolar districts.

Training in Mali Class.—Two candidates were sent to Bangalore for training in the Mali class started in the Lal-Bagh.

INDUSTRIES AND COMMERCE.

Slab-Industry.—The possibility of a slab-industry in Hiriyur Taluk is being investigated.

Loan to a Furniture Factory.—A loan of Rs. 2,500, was sanctioned by the Director of Industries, on the recommendation of the District Committee, for the improvement of the Furniture Factory at Davangere, started by Messrs. S. K. Mundergi and Bros.

Shimoga.

EDUCATION.

Starting of Schools.—An English aided school was started at Nagar, and a day school for the benefit of Halepikas was started at Shindhuvadi.

School-Buildings.—Contribution of seven school buildings was completed during the quarter.

Reading Rooms.—Reading rooms were started at Triyambakapura, Somarsante and Hullatti.

Allowances to School Masters.—The members were of opinion that grant-in-aid school masters should be considered as whole time Government servants and that they should be entitled to both grain compensation and War allowance, and it was accordingly resolved that Government be moved through the Inspector-General of Education to sanction both the allowances to Grant-in-aid school masters.

Opening of New Schools.—The District Committee resolved to request the Inspector-General of Education to secure sanction for the allotment of sufficient funds required for opening 272 new schools during the year 1919.

GENERAL.

Village Improvement Works.—Village Improvement works estimated at Rs. 138-8-0 were executed in the Shikarpur Taluk.

CORRESPONDENCE.

To—The Editor,

Mysore Economic Journal, Bangalore.

Sir,—With reference to the note about "A Virus for the War on Rats" appearing on page 793 of the December issue of your very useful *Journal*, may I draw your attention to a even better method of getting rid of rats; I mean through "Ratol' made by the Tablet Mfg. Co., Cooper House, Ripon Road, Bombay. This, I learn, drives away vermin without killing them. I suppose this will be more suited to those who regard life sacred.

Madras, 27-1-19. P. GANGA DHARAN.

QUERIES.

Hints to Correspondents.

Write on one side of the paper only. (2) Write each query on a separate sheet of paper. This will facilitate answering questions as in many cases they may have to be referred to experts. Put your name and address down on every such sheet. No attention will be paid to unsigned queries. (3) Drawings for illustrations should be on separate sheets of paper. They must be made in black ink only on white paper —not in pencil or colour—and twice the size they are intended to appear, especially reference letters and figures. (4) Put titles to queries, and, when answering queries, put the number as well as the titles of the queries to which the replies refer. (5) No charge is made for inserting letters, queries, or replies. (6) Letters or queries asking for addresses of manufacturers or correspondents, or where tools or other articles can be purchased, or replies giving such information, cannot be inserted except as advertisements. No question is answered through the post. (7) Letters sent by correspondents under cover to the Editor, are not forwarded and the names of correspondents are not given to inquirers. (8) As the space devoted to queries and replies is limited, they should be drawn up as briefly as possible. (9) To facilitate reference, correspondents, when referring to any letters previously inserted, should mention the number of the letter, as well as the page on which it appears. (10) All communications should be addressed to the Editor, *Mysore Economic Journal*, "Ringwood", Bangalore.

3. I require a market for tanned hides, tanned skins, sheep and goat, raw hides and raw skins in all sizes in the United States of America, Canada, in fact all America, England, Europe, Singapore, Penang, Japan, Burma and India. I shall thank you to let me have the addresses of wholesale direct purchasers, and purchasers on commission system, and buyers through agency system for the above.

Banganapalle, 10-2-19. M. H. P. GHATALAH.

BOOKS IN BRIEF.

Hindu Charities in Bombay.—*Compiled by F. K. Dadachanji. Published by the Social Service League Office, Sandhurst Road, Girgaum, Bombay.*

This is the record of a survey undertaken by the volunteers of the Bombay Social Service League, with an illuminating preface by Mr. Dadachanji. The present writer knows how when he went round visiting the temples of Southern India—several thousands of them in the most inaccessible rural areas—he was mistaken for an officer of Government specially deputed to inquire into temple charities generally and how the most ignorant people clustered round him with long complaints against the systematic maladministration of the charities which were nearest and dearest to their hearts. It was the general complaint that mismanagement was the rule and proper administration the exception. There can be little doubt that people everywhere would welcome a suitable Legislative measure to control the charities, some of them being several hundred years old in Southern India. The first step that should be taken in the matter is to enlighten Government of the strength of public feeling in regard to this subject. Second, we must by books of the kind that Mr. Dadachanji has brought out, drive home to the people themselves the immense amounts involved. Thirdly, we must get out, if possible, a comprehensive constructive programme (say, for instance, a Bill for each major Province or Native State) and put it up for adoption in each area. A Central Committee for all India including the Indian States to co-ordinate the work of the whole thus undertaken should also be evolved and it should be its special aim and object to initiate the general programme of work and get the committees in local areas to do their work efficiently and well. Mr. Dadachanji's suggestive preface and our own experience gained through our wanderings of over fifteen years in this part of India suggest that unless a comprehensive programme of work is adopted, the realization of the end in view will be deferred to the Greek Calends. The Social Service League and Mr. Dadachanji deserve to be congratulated on the selfless work they have done in regard to the matter. As a first preliminary it is very good but unless the Leagues in the South take up the work, a general campaign will well nigh be impossible. We commend the book to the attention of the Social Service Leagues and workers in Madras and Mysore.

India in the Middle Age.—*By Stanley Lane-Pool, M.A., Litt. D. Published by K. and J. Coober, Educational Publishers, Bombay.*

To those who are acquainted with Dr. Lane-Pool's *Mediæval India under Mohamedan Rule* and with his biographies of *Babar* and *Aurangazeb* in the Rulers of India Series, it is hardly necessary to commend this admirable little book. It is fully illustrated and written in a manner suited to the young student of Indian mediæval history. A book like this has long been a felt want and we congratulate Messrs. Cooper on its publication. Dr. Lane-Pool has, as might be expected, written within limits. This, however, does not mean that he has sacrificed matter for space, but only adjusted the matter to the requirements of the beginner. The book well merits the consideration of the Madras and Mysore Text-book Committees.

A Primer of Indian Administration.—*By L. F. Rushbrook Williams, Fellow and Professor of Modern History in the University of Allahabad. Published by K. and J. Cooper, Bombay.*

This is an excellent little book giving a summary outline of the growth and structure of Indian administration as it exists to-day. It is based mainly, though not entirely, on the *Imperial Gazetteer of India* (vol. iv.) and on the writings of other leading authorities like Ilbert, Lee-Warner, Strachey, Anderson, Baden Powell, &c. We have carefully gone through the book and can say it is a genuine attempt to give a succinct and correct idea of the Indian Constitution as it is to-day. The treatment of a subject like this requires both knowledge and skill, and both these Professor Williams has bestowed liberally in his book. For the beginner a better book cannot, we think, be recommended. Books of this kind deserve to be studied with Indian history in order that a knowledge of the growth of the Indian constitution might be easily grasped. Hitherto the absence of books of this kind stood in the way of giving effect to a general desire on the part of teachers to the early introduction of the study of the Indian Constitution, but with a publication like this of Professor Williams there will be little excuse for any further loss of time in regard to this matter. The Boards of Studies of the various universities would do well to remember books of this kind in recasting their courses of study in History and Indian Constitution in the years to come.

ACKNOWLEDGMENTS.

Mysore Agricultural Calendar 1919. *Department of Agriculture, Mysore. Price one anna.*

Ground Beetles attacking Crops in Mysore. *By Leslie C. Coleman, M.A., Ph.D., and K. Kunhikannan, M.A., F.E.S. Department of Agriculture, Mysore. Printed at the Government Press, Bangalore. 1918.*

Agricultural Calendar 1919-20. *English Edition. Madras Agricultural Department. Price one anna.*

RECENT PUBLICATIONS.

Some Aspects of Financial and Commercial After-War Conditions. *Reflections of a student of finance on the prospective position. By Leonard Springer. 7½ × 5, 118 pp. P. S. King. 2s. 6d. n.*

Cotton. *By George Bigwood. (Staple Trades and Industries Series.) 8½ × 5¾, viii. + 204 pp. Constable. 6s. 6d. n.*

Indian Studies. *By General Sir O'Moore Creagh, V. C. G. C. B. 8¾ × 5¾, 320 pp. Hutchinson. 16s. n.*

From Mill Boy to Minister. *An intimate account of the life of the Rt. Honourable J. R. Clynes, M. P. By Edward George. 7½×5, 119 pp. Fisher Unwin. 3s. 6d. n.*

Technical Handbook of Oils, Fats, and Waxes. *By Percival J. Fryer, Chief Chemist and Director of a drug manufacturing company, Lecturer in Oils, Fats, and Waxes, at the Polytechnic, Regent-Street, etc., and Frank E. Weston, head of the Chemistry Department, the Polytechnic. Volume II. Practical and Analytical. (Cambridge Technical Series.) 8¾ × 5¾, xvi. + 314 pp. Cambridge University Press.*

The Production and Treatment of Vegetable Oils, *including chapters on the refining of oils, the hydrogenation of oils, the generation of hydrogen, soap making, the recovery and refining of glycerine, and the splitting of oils. By T. W. Chalmers, on the editorial staff of the "Engineer." (The "Engineer" Series). 11½ × 7¾, xi. + 152 pp. Constable. 21s. n.*

The Physiology of Industrial Organization and the Re-employment of the Disabled. *By Professor Jules Amar, Director of the Laboratory of Physiological Research in the Conservatoire des Arts et Metiers, Paris. Translated by Bernard Miall. Edited, with Notes and an Introduction, by Professor A. F. Stanley Kent. 135 illustrations, 10 × 6½, 371 pp. The Library Press. 30s. n.*